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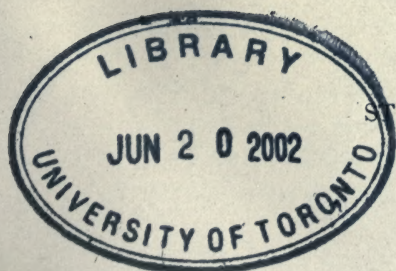
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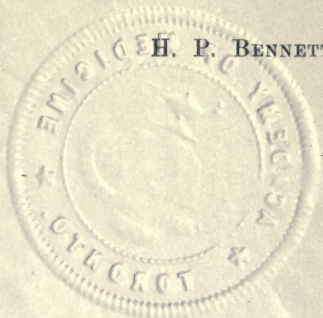
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# THE AMERICAN JOURNAL OF OPHTHALMOLOGY.

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## ORIGINAL ARTICLES.

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I—THE BACILLUS PNEUMONÆ FOUND IN A CASE  
OF CONJUNCTIVITIS.

II—THE BACILLUS PYOCANEUS FOUND IN A CASE  
OF CONJUNCTIVITIS.

III—BLANK CARTRIDGE WOUND OF THE EYE:  
PANOPHTHALMITIS, PROBABLY DUE TO  
BACILLUS.

BY GEORGE S. DERBY, M.D.

Assistant Ophthalmic Surgeon Carney Hospital and St. Elizabeth's Hospital; Ophthalmic Clinical Assistant Massachusetts Charitable Eye and Ear Infirmary.

(From the Laboratory of the Massachusetts Charitable Eye and Ear Infirmary.  
Dr. F. H. Verhoeff, Director.)

CASE I.—E. M., aged 58, a healthy American woman, came under the care of the writer at St. Elizabeth's Hospital on February 24th, 1904. About one month previously she had "caught cold" in her left eye. It had become reddened, there was a slight swelling of the lids and considerable whitish discharge; the lids were stuck together in the mornings. She consulted a doctor and was given a 15 per cent. solution of argyrol to instill twice a day. This relieved the symptoms somewhat, but the discharge continued and the eye still remained red. Examination of the left eye showed moderate injection of the bulba conjunctiva; cornea iris, media and fundus normal. Exposure of the lower cul-de-sac disclosed a considerable quantity of thick, creamy, purulent looking fluid;



the conjunctiva was considerably injected and thickened, there was no follicular hypertrophy. Eversion of the upper lid showed a like condition of the upper-cul-de-sac. The lachrymal sac was apparently unaffected, the naso-lachrymal duct was patent; right eye normal.

During the two weeks following the patient was treated every second day in the clinic with a weak solution of corrosive sublimate and careful cleansing of the conjunctiva; the eye was washed out several times a day at home. Later, applications, first of powdered boric acid, then of iodoform, were made and all without the slightest effect on the progress. She was then sent to the rhinologist, who found a cystic turbinate with an accompanying rhinitis and probable involvement of the ethmoidal cells. The turbinate was removed and the nose cleansed frequently, which seemed to have a favorable effect on the conjunctivitis. Nevertheless the latter did not entirely disappear, and when the patient was last seen, after two months of treatment, there was still a considerable amount of conjunctival injection and discharge, although she had attended the clinic faithfully and the most varied remedies had been tried.

At the first visit a smear was made from the discharge and stained by Gram. The discharge consisted of pus corpuscles and cell detritus, and contained a large number of moderate sized gram-negative bacilli, which were often arranged in pairs, end to end. These bacilli were surrounded by a wide mucoid capsule. Cultures were then made on agar, blood serum and potato.

No. 1. Agar slant. After 36 hours in the thermostat, several large, round, elevated, whitish-gray colonies could be seen, the largest one measuring about 2mm. in diameter. They were soft and could be drawn out into a viscid string with the platinum wire. At the end of 80 hours the whole surface of the agar was overgrown with the colonies which had coalesced.

2. Agar stab. After 36 hours in thermostat, thick, white, translucent nail growth. Later, gas formation.

3. Potato. After 36 hours in thermostat, thin, pale, colorless viscid layer.

4. Blood serum. Kept at room temperature. In 24



hours a number of fairly large, elevated, drop-like, highly refractive colonies, which grew rapidly and later coalesced.

Smears from these cultures showed but one type of organism, a moderate sized bacillus, similar to the one obtained in smears from the discharge. They averaged 1 to 2 inches in length and were half as broad as long; they were sometimes arranged in pairs, end to end, were surrounded by a mucoid zone, did not form spores and were non-motile. They were decolorized by Gram, and occasionally the mucoid capsule could be brought out well by counterstaining with eosin (W. H. Smith), though this was much less apparent in the culture organisms than in those taken direct from the conjunctiva. To test their virulence, 15 minims of a four days' bouillon culture, which showed comparatively few organisms under the microscope, was injected into the peritoneal cavity of a guinea pig. Death occurred in 30 hours from general peritonitis. Pure cultures of this bacillus were obtained from the peritoneal fluid, from the liver surface and from the blood.

As this bacillus coincides in its morphology, staining reaction, cultural characteristics and pathogenicity with the bacillus pneumoniæ of Friedländer it must be regarded as identical with that organism. As no other bacteria could be demonstrated in the smears and cultures at any time during observation of the case, it may be regarded as the cause of the conjunctivitis.

Friedländer's bacillus, although uncommon in the bacteriology of the eye, has been found in cases of ocular infection by a number of investigators, notably by Gourfein (*Revue méd. de la Suisse Romande*, février, 1902), who obtained it 23 times out of 450 cases, a far greater percentage than others have reported. Out of about 150 cases of conjunctivitis examined bacteriologically during the past year, the writer has found it only in the above case.

A resumé of the ocular conditions in which it has been observed includes blenorrhœa neonatorum, acute catarrhal conjunctivitis in which the symptoms may be intense, acute conjunctivitis with subconjunctival hæmorrhages, subacute conjunctivitis with or without ulcerative blepharitis. Also in follicular hypertrophy and in pseudo-membranous conjunctivitis. Apparently in none of the above conditions was any particular



resistance to treatment shown, the duration seldom being over ten days, while in the case described here, although the symptoms were at no time severe, resistance to the usual remedies was marked. This bacillus has also been found in more serious processes, notably in kerato-malacia, in corneal ulcer with hypopyon and also in the contents of chalazia. There have been a number of cases of dacryocystitis reported and the tear sac appears to be prone to infection by this organism. As yet no epidemics have been observed and no instance of contagion from one person to another. By inoculation of virulent cultures it is possible to produce severe corneal ulcers in animals, and injection of the bacilli into the anterior chamber or vitreous, will cause a severe panophthalmitis.

CASE II.—H. H., a healthy male baby, three weeks old, was brought to the Massachusetts Charitable Eye and Ear Infirmary on March 8th, 1904. Soon after his birth his mother had noticed a slight swelling of the lids and a moderate amount of discharge, both eyes being affected. Examination showed a well developed and healthy child. There was a moderate swelling of the upper and lower lids of both eyes with considerable reddening of the margins and slight conjunctival injection. There was a certain amount of thin muco-purulent discharge. Corneæ and irides normal. A 15 per cent. solution of argyrol was prescribed and the mother was instructed to bring the child in the next day for observation. She did not return.

Several smears had been made from the discharge and one blood-serum tube had been inoculated. The smears, stained by Gram, showed a few Gram-positive cocci, an occasional, moderate sized gram-positive bacillus (resembling the *Xerosis bacillus*), and a number of small, slightly curved, gram-negative bacilli with rounded ends, which lay, for the most part, outside the cells.

The blood-serum culture at the end of 48 hours showed a large number of the round orange-colored colonies of the *staphylococcus aureus*, and a few round, greenish-yellow, slightly sunken colonies of moderate size. From one of these an agar tube was inoculated. Over the surface of this a moist greenish white layer developed and the agar took on a



brilliant green color. The growth was profuse and spread rapidly. Smears showed the same Gram-negative, small, slightly curved bacilli, sometimes arranged in chains of two or three. In all respects they were typical of the pyocyaneus group. Unfortunately, before a virulence test could be made, the cultures were killed by an overheated thermostat.

Whether the conjunctivitis in this case was due to the bacillus pyocyaneus cannot be decided with certainty, as the virulence of this particular strain was not tested; nor do we know how virulent was the staphylococcus which was also present. However, the latest writers tend to minimize the importance of staphylococci in the conjunctival sac, and we know that the pyocyaneus may cause certain ocular infections, notably, keratitis with hypopyon and dacryocystitis. In any case the finding of this organism is an interesting and rare occurrence, as it has seldom been observed in connection with the eye.

CASE III.—The history, examination and clinical course of the following case have been taken from the house records of the Massachusetts Charitable Eye and Ear Infirmary.

T. S., aged 19, came to the Infirmary on August 27th, 1903. About two hours previous to his coming, he had been struck in the left eye by the wad of a blank cartridge, which caused severe pain and loss of vision. Examination showed a severe powder burn of the left eyelids. The conjunctiva was markedly injected and pitted with grains of powder. In the lower outer part of the cornea extending into the sclera was a jagged T-shaped wound, the upright arm about 8 mm. in length, the cross bar 4 mm. The anterior chamber was nearly filled with blood, the iris was hardly visible. The edges of the wound bulged outward. T.—3. The fundus could not be seen. Thirty-six hours after entrance all the signs of an acute panophthalmitis were present, and 12 hours later the eye was enucleated. No subsequent complications.

The globe was fixed in formalin, was frozen and halved, and turned over to the writer for pathological examination. Macroscopically there could be seen lying in the anterior part of the eye just behind the wound, a large, square, brownish mass, 7 cm. long by 8 broad, and showing coarse striations (the wad). The greater part of the lens and vitreous had



disappeared; the retina was completely separated from the choroid by blood clots.

The eye was then put through ascending grades of alcohol, imbedded in celloidin, and microscopic sections made.

Microscopical examination gave the ordinary picture of an acute panophthalmitis. The foreign body, which was composed of coarse, refractile, intertwining fibers, was surrounded, except anteriorly, where it was in contact with the posterior surface of the cornea and sclera, by the remnants of the vitreous and a mass of purulent exudate. The anterior chamber contained blood and pus corpuscles. The iris and ciliary body in the neighborhood of the wound had disappeared. There were large extravasations of blood in front of the retina, between it and the choroid and behind the choroid. The cornea, ciliary body, choroid, retina and papilla were densely infiltrated with pus cells.

Sections were stained for bacteria by Gram, Gram-Weigert, carbol-fuchsin and methylene blue, with the following result: Lying in the remnants of the vitreous and in the purulent exudate which surrounded the foreign body, were numerous large bacilli, which could also be demonstrated, although in smaller numbers, between the fibres of the wad, in the cornea adjacent to the wound, in the retina, and in the choroid. A few Gram-positive cocci resembling staphylococci were also found in one small area of the exudate.

The bacilli were large and thick, with rounded ends; they stained unevenly and showed spore formation. The largest forms measured slightly over 5 microns in length and 1.5 microns in breadth, but many were considerably shorter. They formed chains occasionally; did not lie within the cells; stained well as a rule by Gram, but were decolorized by the prolonged use of alcohol. No capsule could be made out.

Although it is impossible, in the absence of cultures, to say definitely that this bacillus was the cause of the panophthalmitis, yet its presence in the wad and in the surrounding exudate and vitreous, the scarcity of other micro-organisms, and its numerical superiority, would lead one to suppose such to be the case. Its identity can only be surmised, but it is suggestive to note that in morphological characteristics,



pathogenicity and evident preference for the vitreous as a favorable soil for development, it shows a marked resemblance to the common hay bacillus (*bacillus subtilis*).

This organism, which is of exceedingly common occurrence in nature, was until recently considered to be a non-pathogenic saprophyte. The first case of acute infection caused by it was reported at the Heidelberg Congress of 1902 by Baenziger and Silberschmidt. It was that of a man whose eye had been penetrated by a metal chip from an agricultural implement. An extremely acute panophthalmitis followed; the eye was enucleated, and a virulent hay bacillus was obtained from the cultures, which produced a similar process when injected into the vitreous of animals. Likewise from the ground which the patient tilled this same virulent organism was isolated. Since then several other cases have been reported and additional light has been thrown on the nature of the process.

It appears that the vitreous both of man and of animals forms a peculiarly favorable culture media for this special pathogenic strain of hay bacillus, while other strains may be regarded as practically non-pathogenic. Most of the cases have been reported from Switzerland and the surrounding territory, and have occurred as a rule among tillers of the soil. Infection has followed the penetration of a foreign body into the vitreous and has been of an especially acute nature.

The identity of the organism found in the case reported above could not be settled beyond doubt. However, it resembled the hay bacillus closely, while the process was also typical of that organism. As the hay bacillus is one of the commonest micro-organisms found in nature, its presence in a blank cartridge wad would not be surprising. Then, too, bacilli have been found but seldom in the acute, destructive inflammations of the eye, and no one of the organisms described bears as close a resemblance to our bacillus as does the *bacillus subtilis*.

In regard to other ocular lesions produced by the bacillus, Gourfein has recently reported seventeen cases of conjunctivitis apparently due to this organism, in two of which there were corneal complications.



My thanks are due to Dr. F. H. Verhoeff for the opportunity to examine the eyeball in Case III, and also for kindly looking over this paper.

#### REFERENCES.

It has been thought unnecessary to review the literature of the three subjects considered, since it is brought up to 1903 in Axenfeld's admirable article, "Specielle Bakteriologie des Auges," in the *Handbuch der Pathogenen Mikroorganismen*, edited by Kolle & Wasserman.

A later article on the bacillus pyocyaneus is that of McNab, *Klin. Monatsbl.*, 1904, p. 65.

Gourfein's article on the bacillus subtilis, which brings the literature of the subject up to date, will be found in the Report of the Tenth International Ophthalmological Congress, Lucerne, 1904.

### COMPLICATIONS FOLLOWING CATARACT EXTRACTION IN GLAUCOMA.\*

BY DR. LOUIS J. GOUX,

DETROIT, MICH.

THE object the author has in presenting his experience in one case of cataract extraction in a glaucomatous eye is to not only relate the history of this particular case, which is at least to say unusual and fortunately uncommon, but also to gather an expression from the members of this Society of similar experiences, and to learn as far as possible the best way of handling these cases as regards prophylaxis and after treatment.

Report of case.—Miss W., aged 60 years, inmate Eastern Michigan Asylum, Pontiac, Michigan, first examined October 20th, 1903. Complains of great pain in eyes with nocturnal exacerbation; vision greatly impaired.

Objective symptoms, injected ocular conjunctivæ, steamy cornea, shallow anterior chambers, oval dilated pupils. Media clear. Tension plus 2 in right and plus 3 in left.

Treatment, dionin and eserine.

February 16th, 1904 —Lenticular opacities in left eye, media clear in right. Tension diminished and eyes less painful.

April 19th, 1904.—Complete cataract in left eye. Ten-

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\* Read at the 9th meeting of the American Academy of Ophthalmology and Oto-Laryngology held at Denver, Aug. 24th to 26th, 1904.



sion plus 2, very shallow anterior chamber. Right eye more comfortable, tension plus 1.

The eyes being in a more comfortable condition than they had been for months, on May 10th it was decided to do an iridectomy and cataract extraction in hope of relieving the glaucoma and restoring vision in left eye. Operation performed under cocaine anæsthesia. Interocular pressure was so great that as the primary incision was completed the lens followed knife through the wound and immediately there was a considerable escape of vitreous.

The lens had been delivered by intra-ocular pressure and collapse of eyeball was so complete that after vitreous had been removed from wound dressings were applied, no attempt being made to perform iridectomy.

Patient was placed in bed, morphine used hypodermically and special attendant provided to carry out instructions. About two hours after operation, patient had intra-ocular hæmorrhage, about a drachm of clotted blood being found under dressings. Wound was again wiped dry and no further untoward symptoms were complained of or were noticed objectively until the fourth day, when the dressings were noticed to be wet with a serous exudate. Examination revealed a very small sinus located at the apex of corneal cicatrix.

Dionin and eserine were again ordered, but after about two weeks all medication was discontinued.

At the present time the vicarious channel still exists, vision is nil, and the eye is evidently doomed to pthisis bulbi.

The experience suggests the following query, viz: "Was there any prophylactic or ante-operative measures other than medicative that would possibly have changed the result?" To the writer the most logical prophylactic measure that suggests itself is that of scleral puncture (posterior sclerotomy). By means of this simple operation the tension of the eyeball can be sufficiently reduced so as to bring about a return of anatomical relations of the parts, making the steps of iridectomy and extraction as easily performed as under normal conditions. For this prophylactic measure it is claimed that in cases of high tension the iridectomy can be much more thoroughly performed when preceded by this precautionary measure.



According to Priestley Smith the results of iridectomy in glaucoma depend largely upon the mode of performing the operation, and he points out the advantage of scleral puncture before the knife enters the anterior chamber.

The development of cataract in this case was clearly dependent upon impaired lenticular nutrition, due apparently to excessive intra-ocular pressure.

The other eye has not developed cataract, at no time has the tension been as high as in operated eye, and at present time is about plus 1 or less.

The chances are that intra-ocular hæmorrhage was unavoidable and that no prophylactic measure would have changed this phase of the situation.

The cicatricial fistula furnished an interesting illustration of nature's attempt to relieve the situation by means of vicarious infiltration.

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## REMARKS ON THE NEED FOR THOROUGH ASEPTIC AND ANTISEPTIC WORK PRIOR TO, DUR- ING, AND AFTER CUTTING OPER- ATIONS ON THE EYE BALL.\*

BY DR. B. E. FRYER,

KANSAS CITY, MO.

WHILE the questions of antiseptis and asepsis in general surgical work are problems quite far from a perfect solution, and dwelling, as these questions do, in the mind of every general surgeon more or less continually, with the resultant hope of attaining nearer to a perfection of technique, it must be said that in general surgery there is, as is well known, more or less continual development and improvement in these important adjuncts to surgical success. Moreover, every careful general surgeon, as a rule, understands the many factors required for asepsis, which I fear is not the case with a large number of ophthalmologists, if the writer can judge by the literature made by oculists on ocular asepsis, or by his

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\*Read at the 9th meeting of the American Academy of Ophthalmology and Oto-Laryngology held at Denver, August 24th to 26th, 1904.



experience in medical societies and conferring with ophthalmic surgeons generally.

In this brief paper I propose very concisely to set forth the need for a greater effort to obtain an aseptic condition for eye surgical operations and also to call attention to some of the main factors needed for successful work in this direction, and moreover, to show that those who are inclined to doubt or who do actually doubt the possibility of any eye asepsis being made at all possible, are in error.

It is conceded, of course, that many of the well known bacteria which are found in normal conjunctiva, live there without the production of any palpable pathologic change or lesion so long as no wound or abrasion exists, but that others of these microbes require no epithelial denudation prior to their destructive working. Moreover, very many bacteria succeed in their destructive doings in a direct ratio with diminished systemic resistance of an individual, plus local lessened resistance, caused by traumatism of any or all kinds.

It is not necessary in this paper to mention in detail the various pathogenic bacteria which are found in the conjunctival sac; they are well known, though it is, of course, possible that pathogenic microbes may be hereafter discovered which are at present unknown and which are generally of unsuspected existence. The habitat of all them is not alone in the conjunctiva proper, but in the glandular openings and follicles, of which there are many in the inner lid surface and which our colleague, Alt, has shown in his excellent work very fully, as he has also shown the existence of accessory lachrymal glands in the lids. Of course, too, the puncta are the avenues from the nares for admission of septic germs. Moreover the Meibomian glands and the bulbs of the eye lashes, the edges and free eye lid surfaces are also sites and hiding, and probably breeding places of these pathogenic workers. The sites as above given are, I admit, generally known, but just as to where in them the bacteria lodge, I believe is neither generally known or understood. In other words, these sepsis producers live and work not only on the external epithelial surfaces, but in and between the epithelial cells, of which latter we have in the conjunctival sac and its appendages and surroundings many differing from each other

morphologically, and also as to the amount of cement substance surrounding each cell and attaching it laterally to its neighboring cell and also to those of the layers beneath, where such lower layer or layers exist.

These facts have a very direct and practical bearing on the production of any aseptic conditions for our line of work. For if the microbial life in the conjunctiva and its appendages inhabited only the surfaces of this mucus membrane and was not found also enjoying a flourishing existence between and under the epithelial cells, the question of inhibition, expulsion and death of this microbial activity might be a much easier and simpler matter.

In order to fully appreciate the need for antiseptic work prior to eye operations, it is well to state that the whole subject of inflammations should be restudied, late pathological experimental work, showing that inflammation processes in their completeness mean that sepsis has preceded them, that either a local septic or a general toxic cause has produced the condition, and that a local trauma or irritant will not, cannot alone produce the full conditions now understood as inflammation. For the eye we may instance as a local septic cause the various pathogenic bacteria as productive of iridocyclitis with the aid of trauma, or of syphilitic or rheumatic iritis from a general and systemic toxin, as the etiologic factors without trauma. It will not do then, if this is true, to assign as a cause of an unsuccessful eye operation the trauma alone, as is generally done by oculists who do not precede their operations with antiseptic precautions and efforts.

It is conceded that many operations on the eye are done and have been done successfully when no attempt has been made toward asepsis, and from this it is argued by some that none is necessary. And while it is true as following eye surgery as it is also true of general surgery, that success has occasionally resulted where no antiseptic attempts were made, still no general surgeon now will believe that any antiseptic efforts should be relaxed, but that operative successes without antiseptic precautions are simply due to the fact that a certain but limited amount of septic material may be met, destroyed and provided for by systemic antitoxins. But this auto-antitoxic neutralization of septic matter is probably less likely to



be available for work in the eye from the different anatomical conditions, and at the same time there is apt to be more destructive effect to the usefulness of the visual organ than occurs from sepsis of a less important function or viscus elsewhere.

It is of interest to the operator to consider that sepsis may gain admittance from local sources: First, from ante-operating factors, such as corneal ulcerations or wounds giving sepsis admittance; second, from septic material introduced at the time of an operation; or, third, as a post operative result from meddling of patient with dressings, or by operator if the latter does not follow antiseptic rules in the after-treatment. It is our duty to try and shut off the septic approach through any of the before-mentioned avenues or modes by every safe method we possess.

Now a few words as to what I consider the best method of safely rendering the field of operation in eye surgery free from septic material. Having tried several germicides in preparing eyes for operation, I have come to the conclusion that at present no known drug or preparation equals argyrol for the purpose. It is most efficient as a destructive of microbic life, without in the least injuring the eye ball or its appendages. This is the first requirement for eye antisepsis, but in addition its permeability and penetration are most remarkable, thus not only destroying microbes which may be on the conjunctival surface, but also going between epithelial cells and even below the first layer of these cells. Argyrol also passes readily through the puncta lachrymalia and into the glandular crypts and follicles, and into the nasal ducts. I use argyrol in thirty per cent solution.

I will give an outline of the method I pursue in the antiseptic preparation of an eye for operation. The face, brow, temple and eyelids are carefully washed with soap and water; after this the same regions are cleansed with a two per cent. solution of carbolic acid. This is thoroughly done, and especial care is had in rendering the lids and their free edges absolutely clean. Then a few drops of a thirty per cent. solution of argyrol is instilled into the conjunctival sac, the eye closed and a sterile gauze dressing of several layers dipped into the carbolic acid solution is applied to the eye, which

dressing is large enough to cover the eyebrow, temple edge and the upper part of the nose of the same side, and also cover the upper cheek surface, and this dressing is retained in position with ising glass plaster; no bandage is applied. This dressing is changed each day, and each day the argyrol solution is instilled, the patient being watched to see that the dressing is not disturbed or the eye rubbed. The number of days required for the complete antiseptic preparation varies, of course; it may take a week or even three. Should there be any nasal disease the nares are sprayed with a solution of iodine in liquid vasaline daily.

If this method is followed carefully and kept up long enough it will result in the production of an antiseptic interval of the conjunctival sac—an interval sufficiently long enough for the closing of any wound or incision, and that without any disturbance of nutrition. After an operation the dressing is generally not changed for forty-eight hours, and when changed the work is done under antiseptic precautions, and before applying a new dressing argyrol is instilled if necessary. No bandage or shield is applied mainly for the reason that with a bandage any change of position of the patient's head upon the pillow will displace the dressing.

I insist in my capital operations that a careful nurse shall be in attendance and watch the patient day and night to prevent any interference with the dressing on the eye. This last precaution should in no case be omitted.

It cannot be necessary to say that the most scrupulous care is necessary to render all the instruments used absolutely sterile, and also that the hands of the operator and assistants are so. Moreover, before the operator's and assistants' mouth a gauze cover is applied.

In every case of a capital nature, too, the general health and condition are seen to and the urine carefully examined.



REMOVAL OF THE ANTERIOR CAPSULE AND THE  
HYPODERMATIC USE OF MORPHIA IN  
SIMPLE EXTRACTION.

By EUGENE SMITH,

DETROIT.

THE SAFEST OPERATION FOR SENILE CATARACT.

By H. GIFFORD,

OMAHA.

COMPLICATIONS FOLLOWING CATARACT EX-  
TRACTION IN GLAUCOMA.

By LOUIS J. GOUX,

DETROIT.

REMARKS ON THE NEED FOR THOROUGH ASEP-  
TIC AND ANTISEPTIC WORK PRIOR TO, DUR-  
ING AND AFTER CUTTING OPERATIONS  
ON THE EYEBALL.

By B. E. FRYER,

KANSAS CITY.

DISCUSSION.

J. M. RAY (Louisville, Ky.): The papers we have just listened to have presented such a quantity of material for discussion, it seems difficult to know exactly where to begin a consideration of the questions. The paper by Dr. Smith, in which I was very much interested, brings up the question we are all much interested in of how to deal with the capsule in cataract operations.

There is no question but what the best method of dealing with it has not yet been settled, and a great many of the most serious complications met with in cataract have been those resulting from secondary operation, so I look on it with much trepidation and concern. Twenty years ago I saw DeWecker doing the operation of removal of the capsule by a pair of forceps similar to those of Dr. Smith. In my experience it does not bring away the capsule in every instance. A great many cases fail to make more than simply a number of rents in the capsule.

In a certain number of cases I believe it can be removed, and when this is done there is no question but what the for-

mation of a secondary membrane is materially lessened but not done away with entirely.

The great trouble in using morphia as suggested by the essayist, is the danger from nausea. Heroin, however, is one of the morphine series which can be used with less danger of nausea. I do not think it would, however, have the same effect as a myotic.

In regard to the cataract incision, I am a believer in the small conjunctival flap. The ideal incision is in the sclero-corneal margin and with a small conjunctival flap. The trouble with the operation of Dr. Gifford, is that on drawing his suture, the pressure is near the center of the cornea, and thus causes the wound to gap, and therefore you will have as many, or more, prolapses, as when done with the small flap without sutures.

I believe when we have large wounds of the cornea, the purse string suture is ideal, it lessens infection, and we can save a great many more eyes with extensive wounds than by any other method.

The question of what is the best operation for cataract I presume will never be settled to the satisfaction of every one. If it were not for the prolapse, the simple extraction would undoubtedly be the operation. I have never been able to get results I hear of others getting. Frequently I have a prolapse and trouble with it. I always sleep sounder the first night after I do a cataract operation if I do an iridectomy.

DUDLEY S. REYNOLDS, Louisville, Ky.: The difficulty in dealing with the capsule has been constantly before my mind, as it has that of others. In 1876 I reported some extractions done by peripheral incision of the capsule, which Dr. Knapp, who was present at the time, kindly appropriated without reference to me. He is welcome, however, as I abandoned it long ago. I have acquired the habit of using almost exclusively the Beers knife. I make the corneo-scleral puncture, pass the knife into the center of the pupillary area and pass down as low as possible in contact with the anterior capsul, and with a slight motion of the hand cause the point of the knife to go through the capsule. Sometimes it goes through making a little flap, and then I make the counter puncture of the corneo-scleral junction so



as to have a small conjunctival flap. I believe this, as a general proposition, in uncomplicated cases, the best procedure. I never use fixation forceps. I always rely upon cocaine anaesthesia. The stitch in the flap was first used by Henry W. Williams, father of our colleague Chas. H. W. He first used a single stitch, which he put in the center of the flap and which he used more than forty years ago, and he continued to use this up to the time of his death. That was a comparatively simple stitch, and I employed it a number of times myself and it caused such irritation in the eye that I abandoned it. The question of the danger from prolapsus has, it seems to me, been clearly stated by Dr. Ray. I should fear to use the dressing he mentions because of the gapping in the wound. As to prolapse of the iris after extraction, I am entirely convinced it is due to faulty dressing. A dressing which causes the least possible pressure, or no pressure at all, is the ideal one. As to the bandage, I think I am on record more than twenty-five years ago against it. I do not use the isinglass dressing. I use gauze, a single thickness, smeared with petroleum and laid over the lash. I spread a little cotton wool so as to fill up some of the inequalities, and then lay a series of narrow strips of plaster to completely cover the eye and at the same time so loose as to make it impossible to have pressure. In the case of a prominent eye and low brow and cheek where I find it difficult to cover the eye without making pressure, I lay the strips along the nose and temporal side without crossing the center except with the gauze. I do not always do the simple operation, but I do so if I can. Iridectomy is a wound sometimes fraught with grave consequences, and I think it is not a desirable complication to add to cataract extraction.

H. V. WURDEMANN, Milwaukee: I take issue with my esteemed friend on the subject of the simple operation. I have made a great many such experiments; all my simple operations have been experiments, and it has taken me several hundred to learn not to do such in the future. My successes in simple extraction in securing perfectly round pupils are perhaps ten per cent. I am ambidextrous and my nerves are fairly good. As regards these flap operations, to those of you who make the Snellen flap—perhaps, too, those

who do the other forms of operation these will not appeal, except where we have wounds of the cornea, or where we have inflammation, as I have made it following Dr. Ellet's suggestion and Dr. Gifford's work, of which I heard a year ago. The Snellen flap made in cataract extraction is the small conjunctival flap; the healing begins immediately, and on the next day the flap is fully adherent. We have no trouble from bleeding since the advent of adrenalin. I always have a stitch ready, using the Williams method, but do not put it in always. In vitreous prolapse I always put in the stitch, not necessarily through the corneal edge of the wound, because I, as a rule, have a sufficiently large coadjunctive flap in which to insert the stitch, and have never after the operation found any vitreous prolapse in almost one thousand extractions. They occur during the operation, and are due either to the maneuvers of the operator or to the movements of the patient. I am much pleased to advocate Dr. Fryer's method in the preliminary preparation of the patient. I insist, even in public practice, that there should be at least twenty-four hours preparation. I have pinned my faith to argyrol and have not been disappointed.

J. J. KYLE, Indianapolis, Ind.: It is a fact that the greater the trauma the greater the liability to infection. I believe with Dr. Reynolds, we can do away with the fixation forceps and thus lessen trauma and therefore danger of infection. I believe that the best results I have had were with the small conjunctival flap. As Dr. Wurdemann says, the adherence takes place within twenty-four hours, and you thus lessen the danger of infection getting into the anterior chamber. I take issue with Dr. Wurdemann in regard to using adrenalin preliminary to making the cataract extraction. Some of the gravest hæmorrhages have followed its use, and I do not believe we can depend upon it as a hemostat. In regard to the preliminary preparation of the eye, I think Dr. Fryer has established a very good precedent. The past year or so I have depended on irrigations of hot boracic acid solutions rather than bi chloride solutions. It is impossible to get the conjunctiva free from organisms, but if we can lessen our traumatism, nature will take care of the organism already in the conjunctiva.



J. A. L. BRADFELD, La Crosse, Wis.: I am heartily in sympathy with the last paper on preparation for extraction. The first thing to be considered is the least possible injury to the eye. Whether we make an iridectomy or a simple extraction, the question is which causes the most injury. When there is a large lens, I believe the iris is more injured by the lens passing through the pupil than it is produced by a simple iridectomy. If Dr. Gifford uses cocaine as he reports, I do not wonder that he has prolapsus, and I should not wonder if he has wounds which do not close. Used as he says I believe it is detrimental to the nutrition of the cornea. The adrenalin is valuable in the ordinary case, and it makes the field much clearer, so I much prefer it. Iridectomy should be made in all cases of those poor patients who cannot let us watch them afterwards, or those coming a great distance; in these cases the anterior capsule should be removed. For simple extraction I suggest the corneal incision with the use of atropia. Use it before the operation and there will be a full, large pupil which will not be injured and iris not dragged into wound when wound opens. Real iridectomies should be made in all cases where there is a heightened tension.

DR. D. T. VAIL (Cincinnati): To discuss these papers anyone could consume an hour instead of five minutes. I wish to mention one or two things not touched upon in these papers. Nothing has been said in reference to holocaine as an anæsthetic remedy. It is more penetrating than cocaine and anæsthetizes the iris much better. I have never found it necessary to inject cocaine subconjunctivally since I began using holocaine. Before its use I had the same experience all have had. If a sensitive iris is grasped the patient cannot refrain from making a squeezing effort, and the usual result is the escape of some vitreous and premature discharge of the lens.

Since I saw some eminent oculists in New York use 1 per cent. holocaine four minutes before the operation and then for two minutes using cocaine, then performing the iridectomy without the slightest movement of the patient, I have resorted to its use in every case.

Occasionally I go back to the old method of making the

corneal incision. If I have a case particularly important, where I want absolutely to get the best results, and fee also, I make the incision corneal and do away with the conjunctival flap. I would advise young operators to avoid conjunctival flaps. I would make the incision in the cornea in my first cases and later on I would adopt this "flap" operation.

In regard to Dr. Goux's case of glaucoma and cataract, I think he attempted too much in extracting in glaucoma where the tension was plus 3. One could not expect anything but the result he had—forcible delivery of the lens, hæmorrhages, etc. I would do a preliminary iridectomy with a small keratome, making the incision well back, and by the *vis a tergo* the iris will spring up into the wound, and it is only necessary to pick up the prolapsed iris and do the iridectomy with the slightest amount of traumatism. This restores the tension of the eye to the normal; later on I would effect delivery of the lens in the usual way. I have followed this method and have succeeded without rupturing the hyaloid membrane.

J. W. BULLARD (Pawnee City, Neb.): I wonder if any of the members present have had the experience with argyrol that I have. I have been using it as a bactericidal agent, and have learned to expect nothing from its use. In purulent conditions of the conjunctiva I have used it day after day without results, the patients returning with the purulent condition, and have gone back to the old nitrate of silver and have stopped the pus. I have not used it in the same way and for the same purpose as has Dr. Fryer, as set forth in his paper. I am wondering if any other member of the Academy has had the same experience I have had. (In answer to the question, I will say that I use it in the strength of 30 per cent.) If he has had the same experience I hope he will be bold enough to state it to this Academy.

ALBERT E. BULSON, Jr., (Fort Wayne, Indiana): The last word on this question of cataract extraction has not yet been said for the reason that we will probably never uniformly agree upon the exact methods of preparing the patient and the kind of an operation to be performed. As a direct result of the better care which the people are giving the eyes by way of proper correction of errors of refraction and attention to other abnormalities, cataracts are becoming less com-



mon from year to year. Notwithstanding the fact that some operators glibly talk of performing from one to two hundred cataract extractions each year, I venture to assert that not one operator in five hundred exceeds twenty to twenty-five cataract operations per year, and the number of reputable and experienced operators who do less will constitute the majority.

Considering that every unfavorable result will have its influence in detracting from the reputation of the operator, it becomes necessary to select that method of operation which gives promise of affording the most satisfactory results for the patient as well as the operator. Very few patients care about the cosmetic difference between a round pupil and one irregular in shape, as produced by an iridectomy, but they do care about the quantity and quality of vision. It seems to be a recognized fact that the combined operation in the average operator's hands is the easiest and safest to perform, and the one less likely to be followed by complications. If this be true we are not giving our patients the best chance of recovering the most useful vision if we adopt an operative procedure generally attended with more risk, and having as its questionable advantage a round pupil. I pride myself upon having secured practically  $\frac{20}{20}$  vision in quite a number of cataract cases in which the combined operation was performed. In a few instances equally good visual results have been secured by simple extraction, but I have had one or two deplorable results in cases in which I performed a simple extraction, and which I am quite satisfied would not have occurred had the combined operation been performed. I therefore think the combined operation is the safest and best for the average operator, and particularly for the large class of ophthalmologists who see but few cataracts each year.

I am not in favor of a preliminary iridectomy several weeks or months before the extraction is performed, as I think with such method the eye is subjected to the influence of infection and other untoward incidents to operative procedures once more than is necessary.

I cannot agree with Dr. Kyle that extended flushing of the eye prior to cataract extraction is essential. In fact, I think that much of the flushing ordinarily done before cataract extraction is detrimental. As Dr. Fryer has pointed out, many pathogenic organisms are beneath the epithelial layer

and cannot be reached by any amount of flushing. Too much flushing only tends to abraid the surface, add congestion and increase the tendency to infection. Our attention might better be directed toward thorough sterilization of the parts around the eye, the instruments and the dressings.

Argyrol is one of our valuable astringents and antiseptics, but I feel sure that the weak solutions ordinarily recommended are of but little use in destroying pathogenic organisms. I have not been able to secure beneficial effects in the eye with the use of solutions of less than 30 per cent, and the solution which I most employ is one of 50 per cent.

For intensifying the anæsthesia and lessening the quantity of cocaine to be employed, I have found it advantageous in the few cases in which I have tried it, to follow Darier's method of injecting cocaine under the conjunctiva following the anæsthesia produced by the first instillation of cocaine. The principal objection to it, so far as I see, is the dull pain following the injection and lasting for some minutes.

MELVILLE BLACK, Denver: I do not believe we will ever convert anybody by these discussions. In looking at the statistics of the subject, they do not vary materially in successful results. I suppose the man who operates along certain lines will continue to do so regardless of what he hears to the contrary. Some months ago I thought I had discovered something, but I found our old friend McKenzie had discovered it fifty years ago. It is hard to discover anything now-a-days. When we read these old fellows we find they did everything we are doing to-day. I refer to a blunt pointed secondary knife I published a little account of in the *Ophthalmic Record*. I do not now claim any priority on the knife, but would suggest that if you provide yourselves with it you will find it convenient in the event of the iris falling in front of the knife during the section. If you do not wish to cut the iris, by withdrawing the linear knife as soon as the iris has fallen in front of it, and replacing it by the blunt-pointed knife, you will find it easy to avoid the iris. My experience is that the iris falls in front of the knife after the counter puncture has been made. A full description of the technic can be found in the February, 1904, *Ophthalmic Record*.

T. C. HOOD, Indianapolis, Ind.: Here we have Dr.



Gifford repeating the well-known recommendation that when we have one eye only we should do the iridectomy, and Dr. Vail saying that when he has a case in which he is particularly interested in getting a good result, he makes the corneal incision. The argument is good in both instances. I do a corneal incision in most of my cases. Like my Ft. Wayne friend, I do not do a great many in a year, but I do a corneal incision in most cases, and I do a simple operation when I can. I avoid iridectomy if possible. If there is a pupil which is sluggish and refuses to dilate thoroughly under cocaine and atropin, I suspect sclerosis of the sphincter pupillæ and that I will have to do an iridectomy; but if it dilates easily, I try to get it out without cutting the iris. If I can, I get it out without much pressure and manipulation.

W. B. BRIGGS, Sacramento, Cal.: In speaking of the ideal operation for cataract, I think there is none that is ideal for all operations and all cases. The personal equation is a large element in deciding on any operation. The operation the man is most familiar with is for him the best. The man who is in the habit of operating successfully by a certain operation should continue to use the same operation. The simplest operation is not, in reality, the so-called "simple operation," which is in many respects more complicated than the combined operation. It took me many years to decide to try the simple operation, and gradually as I have used it more I have been more pleased with the results, and in suitable cases I believe it as near the ideal operation as it is possible to get. But on the other hand, there are a great many cases not suitable for it, and a great many complications that take place at the time of the operation that will make desirable to do an iridectomy. I do not think anybody ought to be too dogmatic in regard to what operation we should advise. We have to vary our procedure as the condition develops during the time of the operation. In regard to Dr. Smith's forceps, I think favorably of them on theoretical grounds. I saw an eminent Vienna oculist using them some years ago, and I thought he was having more cases of prolapse of the vitreous than reasonably accountable for an operator of his skill, and I have never used them myself. Under the doctor's advice that they are not inclined to increase the number of cases of prolapse of vitreous, I shall

be encouraged to try them some time. Dr. Gifford's flap operation I should favor on theoretical grounds, but I shall wait for Dr. Gifford to develop it further before I attempt to employ it.

GEO. F. SUKER, Akron, O.: Theoretically I agree with Dr. Fryer's paper, but practically I do not. In regard to sepsis as a matter of general surgery; firstly, because the eye is an immobile organ, therefore germs will not thrive as well—motion is a contrary factor for the rapidity of bacterial growth. The bacteriological principles employed are not the same as in general surgery. The flow of tears from the lacrimal gland serves as a constant irrigator. If the patient is sleeping and on waking up in the morning you do not find upon microscopic examination in the dry tears in the canthi, a pneumococcus or a diplococcus, but only innocent aerial bacteria, you can make an operation without first excessively flushing. On the contrary, should you have a pneumococcus or a diplococcus, then appropriate treatment should first be given to get rid of them. The quantity of germs has a great deal to do with the rapidity of infection. A certain amount is necessary to produce any inflammatory action or infection. Therefore gentle squeezing of the lids will expose many from the stomata of the border glands. If you find the germs, flush out with a normal saline or boric solution. If you have any lacrimal sac complication, ligate the canaliculus provided the affection is not an acute one. The reason that some fail with argyrol is that they have too strong a solution and they get a precipitation. You must shake your solution and then it will give you a disinfection of the field to which it is applied. The percentage of silver in all of these preparations is apt to be a varying one. The effect of a 2 per cent. carbolic acid solution is practically nil. I would not use it around the face because it is of no value. You can grow germs in a 2 to 10 per cent. carbolic solution and, by serial culture, in a 1-500 bichloride of mercury solution, if you please. (I have proven this and have published a paper on that score). The eye is the only organ to which the general principles of asepsis do not apply as they do in general surgery. You have to modify them. Any wound upon the eye is not on muscular tissue which contracts and dilates. In most instances the eye takes care of the infection, when or-



dinary previous care has been exercised in preparing the field of operation.

J. M. FOSTER, Denver: In regard to the simple operation and iridectomy, it has been well said that it is a matter for individual selection. My experience in both has been favorable. We all get good results with one or the other. There is no one special way to operate an eye for cataract. The point I wish to make has been well brought up by Dr. Smith in regard to the use of his forceps. I have been much pleased in using them the last few years, getting excellent results. I do not get more prolapses than before, the forceps do not lacerate the eye, and you do not have to use atropin to get a large amount of the anterior capsule removed. I recommend it to any who have not tried it. Your results will be excellent.

JOS. BECK, Chicago: I do not rise to discuss the eye papers, but to say a word in regard to what was brought up by Dr. Bullard in regard to the irrigation of the eye. I believe the men who do not disinfect the eye and have good results are the same as the men who do not disinfect the mouth, throat and ear. Disinfection does not take place as rapidly as in other parts of the body. As far as my experience with argyrol is concerned, I have used the stuff strong enough in the nose and throat and yet I know it is not the bactericide it is claimed. In the nose and throat it does little good. Finger, of Vienna, has carried on many experiments and finds that argyrol is not of as much value as our old nitrate of silver, and so far as any good action of argyrol is concerned, the 5 per cent. is as good as 50 per cent., and the rest remains as an inactive substance or is wasted. If it is good in 5 per cent as in 50 per cent. it does not appeal to our reason to use stronger solution. It must be a pretty big and strong bug that can live in the 1-500 bichloride as Dr. Suker stated. My experience in surgery is that a 5 per cent. solution is a good disinfectant. I believe alcohol is better for a disinfectant about the face than a 2 per cent. carbolic solution.

W. L. DAYTON, Lincoln, Neb.: Personally, I believe the ideal operation is the combined operation. I must admit that I have made in twenty-three years but three simple operations. Of course I am prejudiced. I think the operation of greatest safety is the preliminary iridectomy, particu-

larly in cases of immature cataracts. It is true to extract the lens too soon after the iridectomy is dangerous, but I will venture to say that of all the fellows of this Academy not one who has made proper iridectomies has had suppuration to follow. I mean a preliminary iridectomy for the extraction of cataract. In reference to the purse string stitch, I have not used it in the cornea, but I have used a certain stitch in the cornea that brought the parts in closer apposition, and found the result was better in spite of the intense puckering I got with it. With reference to Dr. Smith's capsular forceps, I think it much superior to that of Fuchs, and I imagine there will be less danger of laceration of the anterior capsule.

T. W. MOORE, Huntington, W. Va.: In reference to Dr. Fryer's paper, I wish to call attention to the fact that White, before the American Medical Association, claimed that you could sterilize the conjunctival sac by introducing bichlorid of mercury 1-500 in sterilized vaseline.

DR. EUGENE SMITH, Detroit (closing): I want to make one general statement with regard to the simple extraction: I maintain that a man who has only made three or four in his life is not competent to discuss the subject. I use argyrol two or three days previous to the operation if I find hyperaemia, as we do so frequently in old people, and a few minutes before the operation I drop in a 25 per cent. solution of argyrol. I have seen but one suppuration in five years. I will say with regard to Dr. Goux's paper, that when the anterior chamber is too shallow for preliminary iridectomy, make a posterior sclerotomy, and follow with an iridectomy, as suggested by Dr. Vail. With reference to pain, alluded to by many, I have been in the habit of dropping a solution of cocaine on the prolapsed iris. If not prolapsed, I lift the anterior lip of the wound, drop cocaine on the iris and make the iridectomy absolutely without pain. With regard to the simple or combined operation, both are good. I think the simple is the ideal. I prefer cocaine because it dilates the pupil. It assists me in judging whether or not I can make a simple extraction. Making an extraction through a rigid pupil will be frequently followed by prolapse. The forcible stretching caused by the escape of the lens through the pupil is apt to be followed by relaxation of the circular fibres,



which will favor prolapse. I never have used atropine. I find that prolapse after the simple operation is most frequently due to injury on the part of the patient. I think the minimum of injury is always in the simple extraction. It is one operation instead of two, hence it is the *simpler* operation.

DR. GIFFORD (closing): With regard to the tension of the flap causing the wound to gap, the line of tension is mainly from above downward and tends to hold the flap applied instead of making the wound gap. With regard to conjunctival asepsis, we cannot get these germs out of the sac. When Dr. Fryer thinks he has done so I believe he is much mistaken. I know you cannot do it, and have experimented on this so much that unless the doctor has some contrary experience to show by his own work, I cannot accept the statement that argyrol or anything else will render the sac a septic.

In regard to the dressing, Dr. Reynolds, did you ever get prolapse?

Dr. Reynolds: Rarely.

Dr. Gifford: Then you say it is due to the imperfect dressing?

Dr. Reynolds: To meddlesome interference of the patient.

Dr. Gifford: Then why do you not do something to prevent this? Unless you put on a dressing that will prevent interference of the patient, you have not done all you can do. The nurse may look away, or go to get a drink, and the patient may stick his thumb into the eye or roll over upon it. It is a good thing to have him watched every moment, if the patient can afford it, but you should always put on a dressing that will withstand a considerable blow without transmitting it to the eye, and that does not shift, and that will prevent the patient from sticking his thumb into the eye unless he takes special pains to do so. Some sort of shield fastened with collodium is the only ideal dressing in cataract operation. I was glad to hear Dr. Reynolds advocate opening the capsule with a knife. It avoids introducing an extra instrument into the eye. I use a knife sharpened a half inch on the back as well as the front. I have never had the trouble of escaping aqueous before making the counter puncture. That was the main objection to it. With this knife you can go down to the lower edge of your pupil and then make your counter

puncture, and you get a clean rent and seldom have to do a discession after the extraction of the cataract, although if a discession is done with a sharp knife and subconjunctivally, I consider the danger absolutely nil.

DR. L. J. GOUX, Detroit (closing): Regarding argyrol, I have used both 25 and 50 per cent., but feel convinced that I get as good results with 25 as with 50 per cent. In the throat I have given it up, as I know I get better results with nitrate of silver. It has been a disappointment to me in nasal work. In doing a capsulotomy I use the "Fuchs" forceps, which have a shorter shank than Dr. Smith's, and permit the operator to work in closer proximity.

DR. FRYER (closing): In the opening remarks in my paper I said I was convinced that oculists were not on a par with general surgeons in their antiseptic efforts. I am positive in my opinion since this discussion. The conditions and locations of the bacteria that inhabit the conjunctival sac are misunderstood. Kelly, of Johns Hopkins University, I think it was, took epithelial cells from a surface that had been made absolutely aseptic by bichloride and put these in two different tubes. In one he precipitated the bichloride first and then put the cells in a culture tube. In the one there was a very active growth and in the other none, where the bichloride was in force, simply showing that bichloride had rendered the bacteria in these cells inactive but not dead. You cannot produce their death with the ordinary use of bichloride in the eye for obvious reasons, but you can with the argyrol. One thing with regard to the preparation of all our solutions: You go to the ordinary druggist for distilled water and you get it loaded with microbes. These gentlemen who do not get a positive result from the argyrol and an aseptic condition, do not get pure argyrol to begin with. In other words, it contains many microbes. It will kill them, but you have reduced the strength in this way. I have studied this subject very carefully. Dr. Suker's statement that the motility of the eye will not allow the activity of these microbes is an error, or why should we have the gonococci, etc., so active and destructive? You can render these microbes inert better with argyrol than with bichloride, because the argyrol even in 50 per cent. strength, is harmless to the eye but death to the microbes. I will not take the time to discuss the other papers



to any extent, but Koller, with whom I have talked in regard to the use of cocaine, says that if it is used long enough in weak solution, it will render the iris absolutely free from sensation. It is better than holocain, which, while it anæsthetizes very well, will not do the work cocaine does.

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## CENTRAL SUPERFICIAL CHOROIDITIS, REPORT OF A CASE.\*

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DISEASES of the fundus oculi presenting lesions recognizable with the ophthalmoscope possess as a rule, principally a diagnostic and pathologic interest. Unless the underlying causative condition be specific disease, the outlook for a cure in alterations of the deeper structures of the eye under every known method of treatment, observes the French therapist, Darier, has been so slight that many practitioners have come to abstain from all serious attempts at any treatment. The case here reported is a fortunate exception, and this may serve as my apology for placing it on record.

One cause of insuccess in the treatment of the affections of the choroid and retina is due to the fact that these delicate structures so rapidly suffer irreparable damage before even the patient is aware of the gravity of his disease; destruction of anatomical elements and an indelible cicatrix are the consequences.

It is quite intelligible, when the anatomical, especially the vascular and consequent nutritive relations which subsist between the inner layer of the choroid (chorio-capillaris) and the outer layer of the retina (the percipient elements, the rods and cones) are considered, that the retina is so generally involved when the choroid is affected, so that in many cases it is necessary to denominate the disease by a term which includes both membranes.

X. Y., a lady aged 30, began to notice that the sight of the right eye was blurred about February 20, 1903, attention being prominently drawn to the defect by the patient's occu-

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\*Read at the 9th meeting of The American Academy of Ophthalmology and Oto-Laryngology held at Denver, Aug. 24th to 26th, 1904.

pation, that of an oculist using the ophthalmoscope and retinoscope daily. Nevertheless at that time the vision was found to be full in amount. The defect was described as a blur of the object fixed with that eye, the surroundings being clear as usual.

Examination with the hand ophthalmoscope at this time failed to show any lesion, the symptom being regarded as of nervous origin. Two weeks later the vision had fallen to  $\frac{5}{8}$ . At times the pupil of the right eye was twice as large as the left.

The ophthalmoscope now showed some increased depth of color in the macular region. The symptoms persisted and the vision continued to grow worse, falling to  $\frac{5}{15}$ . About this time the patient was seen by Dr. H. F. Hansell. Thorner's ophthalmoscope showed slight swelling and deeper color of the macula. Examination by Dr. M. F. Butler revealed the presence of some purulent discharge from the sphenoidal sinus on both sides. The affection of the sinus was regarded as in some way connected with the macular lesion. The blurred vision continued for several weeks. At the end of this period, the vision began to improve quite rapidly. The ophthalmoscopic appearance became more pronounced, consisting of a number of yellowish white plaques—half a dozen—in the macular region. At this time the patient was seen by Dr. Edward Jackson, who was inclined to regard the plaques as situated in the choroid, as they undoubtedly were. The vision continued to improve up to final complete recovery. The ophthalmoscopic findings now consisted of faint yellowish markings in the macular region.

January 19, 1904, eleven months after the onset of the trouble, the patient says that she feels as if there was still "something wrong," although when trial is made of the eye, the object fixed comes out clearly. Vision is  $\frac{5}{5}$  mostly.

The macular region O. D. is occupied by half a dozen yellowish plaques looking as if the full red of the fundus reflex had been bleached out.

June 16, 1904, the yellowish white plaques are still visible but much fainter. The patient says she "feels as if the right eye had to make a greater effort to see than the left." She involuntarily closes the right to rest it, but continues her work without special trouble.



The fields are normal for form and color.

The treatment consisted in abstention from use of the eyes for a few weeks and atropine; profuse general sweating was excited by daily hot baths.

There are two points of special interest in this case of fundus lesion. The first relates to the tissue affected. We were at first inclined to consider it a lesion of the retina, standing in some, but not obvious, relation with the purulent affection of the sphenoidal sinus; but the subsequent development of the yellowish plaques in the macular region makes it about certain that the lesion was in the choroid. It seems undoubtedly to belong to the class of obscure choroidal conditions not yet perfectly classified. Of these, Juler, for example, observes that there are many rare ophthalmoscopic appearances of the choroid which are extremely difficult to classify, as they overlap each other to a considerable extent, and as their pathology is still very obscure. The case here reported is of the variety known as central guttate choroiditis. This form appears to have been first described in England by Mr. Hutchison; it is generally known as Tay's choroiditis. Some of these cases show other changes of the fundus. In most of them, as also in the one here reported, the fovea is less affected than the surrounding region. In many, too, the visual acuity is scarcely at all affected. In connection with these types of choroidal disease affecting the macular region, the so-called retinitis circinata of Fuchs is to be mentioned. While ophthalmoscopically an affection of the retinal structures, microscopical sections have shown marked disease of adjacent choroidal vessels. The subjects of these types of central disease are usually advanced in years. Nettleship, in a paper calling attention to the relation of the choroidal arteries and some forms of localized choroiditis and retinitis asks the question, "Has any one watched the onset of Tay's guttate central choroiditis and seen it either increase or diminish?" He rather suggests a negative answer, though he seems to believe that in one case he was able to determine that the disease had spread over a wider area and that the individual spots had become decidedly larger. In my case we could clearly follow the evolution of the affection from the period when the only visible change consisted of a certain oedema of the macular region to the development of the plaques with the subsequent fading of the same, until their almost complete disappearance. So that at present, it would probably be difficult for an observer who had not seen them when they were well marked to discover them.

In the absence of any constitutional taint, to what cause are these forms of disease of the macular region to be referred?

Nettleship believes that disease of the posterior ciliary arteries is responsible for these macular affections. Both the choroidal and retinal capillary network of the macula is extremely close, much closer than in any other part of those structures, so that the rapidity of the blood stream is influenced in a greater degree by the condition of the larger arteries which supply it, than where the meshes are coarser. Thus we can understand why, in consequence of endarteriitis or other change of the arterial wall narrowing the lumen of the vessel should affect the macular region especially rather than the more peripheral portions.

In the case reported, the patient was firmly convinced that prolonged, perhaps excessive, use of the eye with the ophthalmoscope and the plane mirror had something to do with her complaint.

Lesions of the fundus from direct exposure to the sunlight as during an eclipse, are well known. The usual results of over-use of the eyes show themselves in asthenopias and hyperæmias that we are all so familiar with in daily practice. Nature usually gives strong hints in this way before the danger line is reached. But cases have been reported from time to time of serious organic lesion directly traceable to over-use.

Upon the discovery of the sinusitis we were at first inclined to ascribe to it the cause of the macular affection; but we have since thought that this was an accidental complication, especially as the ocular disease subsided while the affection of the sinus continues.

#### DISCUSSION.

EDWARD JACKSON (Denver): I saw this case about the time vision was beginning to improve, and the macular changes were becoming positive. At that time any one would think he had to deal with patches of choroidal exudate. The appearance was that seen in the early stage, and comparatively slight, but still unmistakable. It is an interesting case, and of great value from the fact that it has been followed through its whole course. We have all seen changes of the macula with the decided change of vision, and a case of this kind seems to throw great light upon their mode of origin.

DR. SCHNEIDEMAN: I forgot to say that the patient is a perfectly well young lady, and without history. The urine, repeatedly examined, was negative. Nothing was suggested as to the cause of the fundus lesion.



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## ORIGINAL ARTICLES.

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### A NEW SERIES OF SEMAPHORE CHARTS FOR TESTING THE VISION OF RAILROAD EMPLOYEES.\*

BY NELSON MILES BLACK, M. D.,

MILWAUKEE, WIS.

THE author makes no claim to originality in using test cards with semaphore figures as the idea of using figures representing the various positions of the arms of a semaphore was advanced and put into practical use by Dr. Chas. H. Williams many years ago. His charts, however, are black figures on a white background, the portion of the figure representing the arms of the semaphore subtending an angle of  $0^{\circ}$ - $5'$  at 20 feet and at this distance "these signals will appear of the same size as a standard semaphore arm 46 inches long, seen against a sky background, at a distance of 2600 feet." They partake, however, more of the nature of an illiterate test chart.

The figures on the cards here shown are reduced by scale by Mr. L. R. Clausen, Signal Engineer of the C. M. & St. P. R. R., and represent at 20 feet a standard semaphore pole and arm seen at one-half mile (2640 ft.), with actual colors used for the distance and home signals, placed on a neutral grayish background, which corresponds to the average tint

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\*Read by H. V. Würdemann at Denver, Colo., Meeting of Amer. Acad. of Ophth. and Oto-Laryng., Aug. 26, 1904.

of the horizon against which a semaphore in an ideal position is seen. In this reduced figure, at 20 feet, the arm of the semaphore subtends an angle of  $0^{\circ}-5'$ .

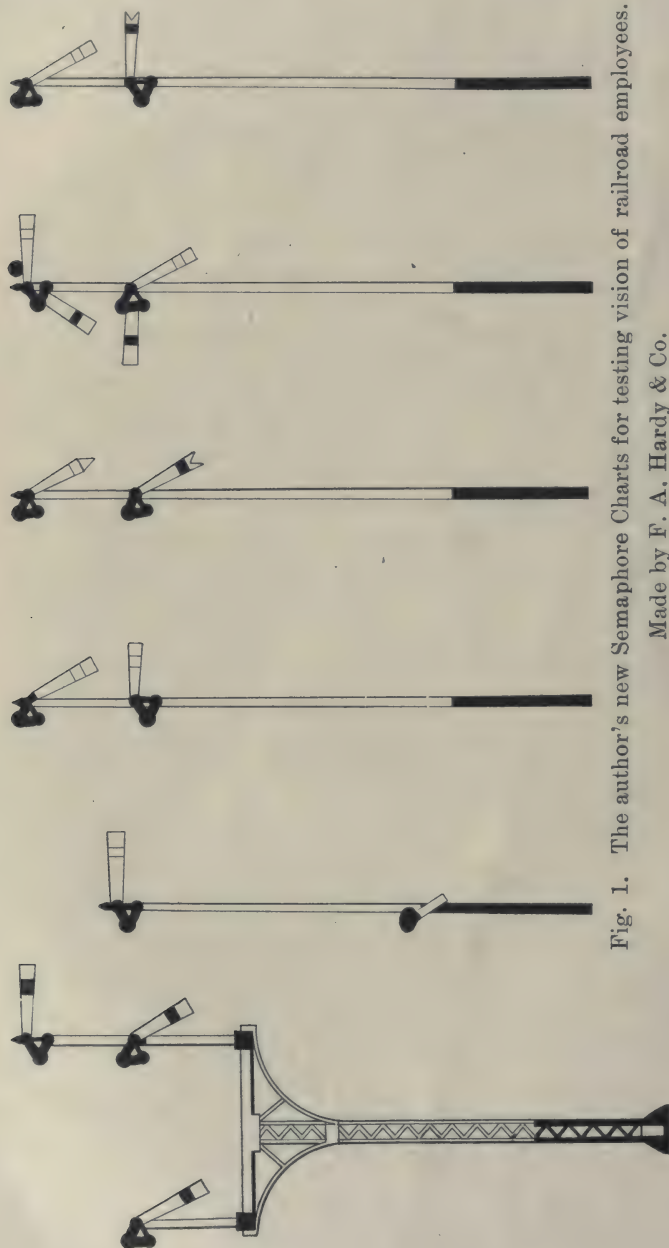
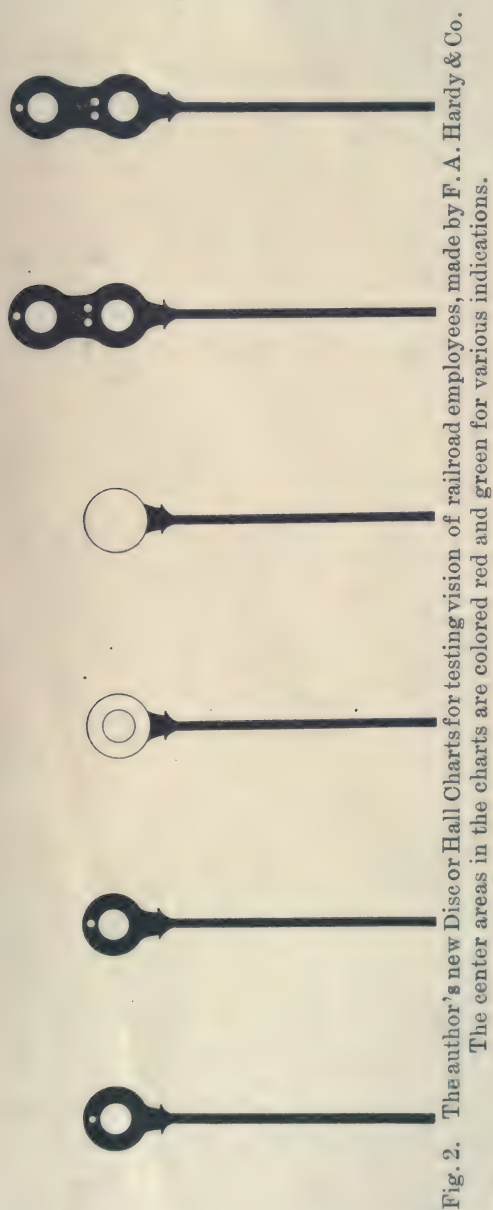


Fig. 1. The author's new Semaphore Charts for testing vision of railroad employees.  
Made by F. A. Hardy & Co.



One card shows single blades in various positions; another various combinations of double blades, Fig. 1; a third represents a scale reduction of the Hall or disc signal in use on many roads for block signaling, Fig. 2.



Many railroad men have remarked that Dr. Williams' sets of semaphore test cards fail to fulfill their intended sphere, as they do not resemble semaphores sufficiently.

The addition of the colored blades in this set has no special significance in cards No. 1 and No. 2, as the position of the blade governs the engineman, but as all semaphore blades are painted some color, usually red, green, or yellow, these figures were so colored to represent existing conditions. It will be noticed, however, that the blades have different ends, i. e., square, forked, or fishtail, pointed and rounded (concave or convex). These have a special indication, but at 2640 feet they can hardly be determined; the square end is usually used for home signals at interlocking plants and with the new style train order signal. The fishtail end for distance signals, and the pointed ends on some roads for train order signals.

With card No. 3, the color of the disc exposed gives the indication. With this card the person examined should not be required to name the colors, but should state whether the indication is *danger*, *caution* or *clear*. The reason for this is ignorance of the names of colors displayed by many men examined; they may be able to perfectly match the Holmgren wools, but if asked to name a color, are completely at a loss.

It would seem a good idea in using the Holmgren wool test in the examination of railway employes to have three boxes marked "danger," "clear" and "caution," and have the person examined place in these boxes all the various colors and shades of colors indicating such conditions to him. The results obtained would be the same as in matching the test skeins. Asking the name of the color in the lantern test should also be changed to requiring the one examined to state whether the color shown indicates "clear," "caution," or "danger." As many roads are using green for clear, and yellow for caution, the addition of various tints and shades of yellow should be included in the sets of test wools.

The reason for suggesting these changes in the methods of examinations is the fact of complaints made, not only by the men who fail, but those who pass the examinations successfully, that the methods are too severe and are entirely



foreign to conditions with which they meet in actual work; and a man will feel much better satisfied if turned down in an examination in which the methods bring into use the objects he comes in contact with and the terms he uses to express his findings. These methods, however, must be scientifically correct and the present high standard of requirements maintained.

## DISCUSSION.

DUDLEY S. REYNOLDS, Louisville, Ky.: I think this an eminently practical paper, worthy of its author and worthy of this Academy which promulgates it. There has been too much that is technical but impractical, and it seems to me this does away with all the objections to other forms. It is practical, in accord with the signals in use, and does away with the requirements in discriminating the details of the different shades of color, with which very few people are familiar.

ALBERT E. BULSON, JR., Fort Wayne, Ind.: This paper is certainly a worthy supplement to the excellent paper by Dr. Black, presented at the last session of the Section on Ophthalmology of the American Medical Association. Those called upon to test the visual acuity and color sense of railroad employees should be very grateful to Drs. Black, Williams, and others who have been giving the subject such extended study, and who have advanced so much new and practical knowledge regarding the work.

The visual tests ordinarily employed in the examination of railroad men, and others who must be familiar with colored signals, are not adequate for the reason that the conditions under which the tests are usually made do not sufficiently correspond with the conditions presented in actual service. The appearance of a signal as seen by an engineer will vary with the changes in weather, quality and kind of light, back grounds, and many other influences. Therefore, in determining ability to distinguish signals the tests should conform in the largest measure possible to the conditions

presented in service. That many of the signals used in railroad service are poorly adapted to the purpose for which the signals are intended, seems thoroughly proven by the observations and investigations of Dr. Black, and his recommendations and conclusions should meet with favorable consideration at the hands of railroad officers.

One feature of importance in the tests of color vision is the determination of central color scotoma. An engineer or fireman who can sort out colored wools and by such tests pass a satisfactory examination may if tested with the perimeter present a well marked central color scotoma. Such a defect should at least create a doubt as to the fitness of the applicant for positions requiring quick and proper recognition of color signals.

EUGENE SMITH, Detroit: As bearing upon the advisability and desirability of doing away with the naming of colors, I have in mind the case of an old captain who had been forty years on the lakes and never had an accident, who came to me several years ago, saying he had been sent up for examination for color blindness. He could tell which was the port color and which the starboard, but he could not name red or green. I had to report him color blind. After forty years without an accident, he lost his position and he was incapacitated for anything else. He simply could not tell one was red and the other green.

J. A. DONOVAN, Butte, Mont.: Dr. Smith's experience recalls a case I had where the man was practically completely color blind. He had been on that road for 36 years as an engineer and one of the best men on the road. The superintendent did not like to let him go, and the chief dispatcher went over the road at night with him and again in the day time, and put him through every kind of a test and he never made a mistake, but he could not tell blue from red in my office. The chief dispatcher assumed the responsibility and he was retained.

DR. WÜRDEMANN (closing discussion): Dr. Smith and Dr. Donovan brought out that the final test should be made in the railroad yards and with the men at their work. While we hold that they should have perfect color sense and normal visual acuity, yet there are occasions in this vocation, in



which color scotoma may be found outside of disease and toxic amblyopia. The fireman, with the fire box open, looking into the fire every minute or two, when he closes the fire box cannot immediately see well in the distance, from blinding caused by the intense glare of the furnace. The wearing of the new amber protective glass, gives relief. I wish to add that Dr. Black has traveled over 6,000 miles in a railroad cab making these observations.

### NOTES ON THE USE OF DIONIN.\*

THOMAS C. HOOD, M. D.,

INDIANAPOLIS, IND.

During the last decade the general therapist, and the specialist as well, has had laid upon his table numberless examples of the products of synthetic chemistry. Many of them have proven worthless and are forgotten. Some, while failing to measure up to the claim made for them, have, nevertheless, remedial virtues enough to warrant their addition to our formulary. Now and then a compound is met with, which arrests our attention at once by reason of its peculiar properties and profound effect. If these properties and effects, then, continue uniform and unvarying and are such as may be, with reason, applied to relieve and counteract certain pathological conditions, then we have a useful remedy which properly merits a place in our list. Dionin, I believe, belongs in this last category, along with argyrol, eucaine, holocaine and perhaps thiosinamine. It is a new drug in ocular therapeutics but its history has already been given to the profession and I shall not go into it further than to say that it is known chemically as ethylmorphine hydrochloride, a homologue of codeine, and that we owe its introduction into ophthalmic practice to Darier, who reports on it quite enthusiastically in his late book on ocular therapeutics.

He states, however, that the drug was first used in eye practice by Wolffberg of Breslau. Previously in general

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\*Read at the Meeting of Amer. Acad. of Ophth. and Oto-Laryng., Aug. 26, 1904.

practice it had been employed by Schroeder and Korte to combat the irritation cough of phthisis, chronic bronchitis and lung emphysema, proving, in their hands, superior to codeia. Wendell Reber and others have reported briefly on its use in diseases of the eye, and it has found favor with most of those who have made trial of it. The drug has not the power of producing local and superficial anæsthesia as do cocaine and holocaine, but is rather to be classed as a deep analgesic, with an action which is usually prompt and prolonged. Its effect is also considered to be to a marked degree resolvent and absorbent. If now we have in it a remedy which will relieve the intolerable pain in those ugly cases of inflammation of the iris and ciliary region alone, where atropine fails, as it sometime does, then certainly it must prove a very valuable addition indeed.

It has not only done this for me but it has in a number of cases, I feel sure, materially shortened the course of the attack and helped to remove lymph deposits and exudates, the usual debris which such inflammatory storms are prone to leave behind to cloud and perhaps permanently damage the vision. Its mode of action is still somewhat problematical, but there occurs, immediately upon the instillation of a three or five per cent. solution, a dilatation of the conjunctival capillaries and a marked increase in the current of the lymph streams and the size of their channels together with a very considerable transudation of serum under the scleral conjunctiva so that there is an appearance of chemosis, with a slight transitory smarting, which latter subsides in a few minutes. This transudation is presumably taken up by the larger superficial capillaries of the conjunctiva so that in the course of two or three hours the eye resumes, for the most part, its previous aspect. Whether the prompt relief from pain which follows its instillation, in most cases, is due to this sudden depletion of the deeper structures of the eye or to an obtunding effect upon the sensory nerve endings therein is not yet definitely made out, but the empirical fact is well established. It is readily soluble in water up to fourteen or fifteen per cent. and its solutions do not soon deteriorate.

I have not been able to note any difference in the effect



from 5 per cent. up, except in the matter of smarting. The stronger solutions hurt more.

A solution of 5 per cent. is probably the best strength to use and one instillation every twenty-four hours has ordinarily sufficed, in my experience.

The fact that its effect diminishes with each application has been observed, but I can not agree with the statement that its lymphagogue action is exhausted in two or three days. I have seen it produce the usual œdema and puffiness when used for the fifteenth time on as many consecutive days.

The reaction following its use varies in intensity with different individuals and it is always well to instruct each patient as to what the immediate and ultimate effects will be and somewhat of the rationale of its action, else they may be frightened and not return.

The summary of Reber is as good as any I have yet seen and coincides with my own experience so far as that goes.

1. It is an analgesic of no little power.
2. The action of atropine seems to be enhanced by it.
3. That it has upon the eye a powerful vaso-dilator and lymphagogue action.
4. That it is of value in promoting the absorption of exudations, deposits in the pupillary space, and of post-operative debris after cataract extraction.
5. That it helps clear up corneal opacities in some cases of interstitial keratitis.
6. That it seems without effect in all other forms of corneal opacity.
7. That its influence on the glaucoma process is yet unsettled.
8. That it should be widely used and the results reported in order that a final correct estimate of the value of the drug may be made.

The cases which I wish to report comprise two cases of marginal keratitis with ulceration (Abbott, Keefer), one case of interstitial keratitis following varicella (Perrine), three cases of iritis with complications (Bals, Cox, Perkins), two cases of post-operative trouble following lens extraction (Leisman, Smith), and one case of keratitis following severe lime burn (Dourman).

Case 1. Mrs. H. A., age 19. Health otherwise fair. Presented a small but rather deep ulcer at the limbus of the lower outer quadrant of cornea of left eye with an area of infiltration involving several millimetres of cornea and a corresponding area of episcleral thickening, no iritis. Treated by family physician for one week previous to consulting me, with one grain atropine and hot bathing which failed to relieve the severe pain and had no effect on the ulcerative process. Pupil only moderately dilated. Atropine sol. increased to two per cent. and ulcer touched with pyoctanin. Four days later, pupil fairly well open, pain somewhat less severe but patient still had to resort to morphine for sleep. Continued atrop. and hot fomentations. Applied Dionin Sol. 3 per cent. with entire relief from pain in half an hour and the relief was maintained by one instillation on every alternate day and at the end of ten days the ulcer was entirely healed while in five days more the eye was clear of all redness.

Case 2. Helen P., age 7. April 15th. Had Varicella two weeks ago. Right eye red and sensitive to light ever since, has marginal ulcer in lower and outer quad. Treat. Pyoctan. Atrop. 1 per cent. with an eye drop of boric acid and adrenalin for home use. This treatment was continued until May 17th, when the ulcer was entirely healed and the photophobia much lessened. All of the lower half of the cornea, however, had become more or less cloudy from exudate, with pin point spots of denser cloud,  $V = 20/200$ . Stopped atropine, prescribed Syr. Iodide of Iron, and began the application of 3 per cent. dionin every other day. June 1st, cornea clearing, treatment continued. June 14th, cornea still clearing. Dionin strength increased to 5 per cent. June 23rd, cloudy area reduced to two millimetres at lower border,  $V = 20/40$ . Patient left city and passed from my hands. No report since.

Case 3. Mrs. K., age 50. Was called to see this case which was in the care of a competent oculist of a neighboring city, and had received the classical treatment for two weeks with but little or no relief from the severe pain. The ulcer was large but not very deep and occupied the upper quad. of left cornea and there was a mild iritis.

Dionin 5 per cent. was added to the treatment. One week later a report from the doctor in charge stated that the



patient was free from pain and ulcer healing. A second report ten days later said ulcer was entirely healed and patient grateful.

(Note) Patient had a malarial toxæmia for which she was receiving the proper treatment, mainly quinine in large doses.

Case 4. Mrs. J. B., age 21. Feb. 16th, '04. Iritis with interstitial keratitis, right eye, beginning one week after a tonsillotomy which was followed by considerable reaction and very slow healing. No specific history obtainable. Had a uric acid diathesis. There was pain lacrimation and photophobia, with cloudy cornea R. V—10/200, L. V—20/20. Atrop. from family physician for one week lessened all the symptoms except the corneal cloudiness which was increasing. Atropine con. and K. I. gr. 15 t. i. d. added.

Mch 1st, cornea clearing. Stopped atropine and increased K. I. to 20 gr. t. i. d. V—20/120.

Mch. 10th, K. I. disagreed and patient discontinued it.

Mch. 20th. Patient returned with increased corneal trouble, V—20/200. R. Syr. Hydriodic Acid. Zi. t. i. d. and instilled dionin 3 per cent. every other day. Mch. 30th. Cornea clearing V—20/80. Treatment continued. Dionin increased to 5 per cent. Another relapse in May was controlled in the same way, and a course of salicylate of soda followed by urotropin has cleared up the case and the patient has now 20/30 vision, and a clear cornea.

Case 5. Ralph C., age 21. June 6th, '04. Iritis with ciliary involvement. Syphilis two years ago, mild attack, treated with mercury and K. I. Right eye became red and vision dim two weeks ago, V—20/80, L. V—20/15. Iris muddy. Pupil small and irregular, almost no reaction. Floating opacities in vitreous. Moderate pain in and about the eye in the last twenty-four hours. Has taken 7½ grs. K. I. on his own initiative for a week. Hg. Protiod. gr. ½ t. i. d. Instilled atropine 1 per cent. once daily. June 9th. Pain lessened, pupil irregularly dilated, treatment continued. June 12th. Much pain since the 11th, P. M. Iritis increased. Took one ounce of blood from the temple and added dionin 3 per cent. to atropine. Protiod. continued. June 13th. Eye quiet, no pain, treat. continued. June 18th. Eye clearing, Protiod. reduced to grs. ¼ t. i. d.

other treatment continued. June 29th. Eye clear. V—20/30. Atrop. and dionin discontinued for ten days, then dionin 5 per cent. for seven days.

July 20th. Eye clear V—20/20.

Case 6. Randolph P., age 24. May 10th, 1904. Irido-chorioiditis.

Has had dim vision in left eye for nine weeks. Consulted another oculist but did not follow his advice. Denies syphilis. Had acute rheumatism at six years. In Colorado eighteen months for weak lungs two years ago. Eye red, pupil irregular, vitreous cloudy, tension normal, a typical triangular deposit of lymph dots on the posterior surface of cornea, but little pain, L. V. 6/200, R. V. 20/20.

K. I. gr. 15 t. i. d. with daily instillations of 1 per cent. atropine and dionin. May 18th, improved. L V 15/200, no pain, treatment con. May 29th. Still improving, V 20/200, treat. con. and dionin per cent. increased to 3 per cent. June 10th, redness gone, vision remains at 20/200, lymph dots being absorbed, vitreous still cloudy. June 24th. Dots have disappeared, vision still cloudy, 20/200. Stopped atropin and dionin.

July 10th. Eyeball clear, vision still interfered with by large mass of exudate floating about the axial line of the globe. Ordered K. I. gr. 20 t. i. d. for fifteen days in each month.

Case 7. Mrs. Wm. L., age 69. March 14th, '04. Senile cataract. Left eye. Combined extraction, clear pupil, counted fingers, healing uneventful until the night of the fourth day when a neighboring brook flooded the house and room of the patient and resulted in an inflammatory reaction in the globe with an iritis which caused much pain and distress for ten days in spite of the usual treatment, filling the pupil area with much exudate and seriously endangering vision. 5 per cent. dionin was then added to the atropine solution and instilled once daily for fifteen days at the end of which time the inflammation had subsided and the pupillary exudate was largely absorbed so that a decision on May 23rd, gave the patient a vision of 20/80 with + 10. Ds.

Case 8. Charles S., age 72. May 24th, '04. Senile cataract R. E.



Combined extraction, clear pupil, healing progressed well until the seventh day when iritis developed with much pain, which was not controlled by atropine and wet cups and only yielded when a 5 per cent. solution of dionin was instilled. There was in this case little or no exudate and the final visual result was excellent. Tested on July 29th, V—20/30 with + 10 D. s.  $\bigcirc$  + 1 D. c. ax.  $180^{\circ}$  and Jaeger I. with + 16 D. s. and the Cyl.

Case 9. Carrie D., age 50. June 17th, '04. Both eyes burned by freshly slackened lime—the left more severely. R. V.—fingers at one foot. L. V.—P. l. Both the ocular and palpebral surfaces involved.

Both corneal surfaces were parboiled, the left one worse. There was swelling of the lids and chemosis—but surprisingly little pain. The usual treatment was applied and the inflammatory reactions all subsided in four weeks—but the corneae remained cloudy and the vision poor. Dionin was then used for three weeks at the end of which time R. V. was 20/30 and the left cornea had cleared so that V—20/200.

These cases do not prove much perhaps but I submit them for what they are worth towards settling the status of this remedy.

There are two other classes of cases in which, theoretically this drug ought to be of some service, when we consider its peculiar action.

They are, first, glaucomatous conditions, and, second, those forms of cataracts in which the initial degenerative changes take place in the superficial fibers of the lens and which are characterized by the well known striae of opacity seen extending from the region of the equator toward and into the pupillary area.

The reports of results from its use in glaucoma are, so far as I know, negative, but it deserves a more extended trial.

If cataract of the lens, particularly the form just referred to, is the result of diminished and insufficient nutrition, then this remedy with its stimulating and lymphagogic action ought to assist in restoring the normal tissue metabolism.

I have under treatment and observation a few such cases but they are as yet too recent to report upon.

## DISCUSSION.

A. ALT: It seems strange to me that dionin produces nothing but good results, in the hands of all reporters and in all diseases of the eye, and I must feel sorry that I have not used it oftener. But in the few cases in which I have used it, I was so discouraged that I have been almost afraid to use it again. For instance, I used it in a case of iritis. The man was suffering intense pain and I told him I had something that would quickly relieve him. I instilled myself and I gave him a 5 per cent. solution to use at home before going to bed; but instead of obtaining relief, he stated that he had much more pain than ever before, and begged me never to use that remedy again. Why this should be, I do not know. I made the solution myself. If dionin always acts in the way the doctor says, I can not comprehend why in this and several other cases it caused such great pain, even worse than the disease itself. The reader of the paper, also remarks that it might do good in cases of beginning cataract. How that can be possible I cannot understand. As soon as you see well marked striæ in the lens you have to deal with dead tissue. We cannot replace this dead tissue by normal lens fibres.

ALBERT E. BULSON, JR., Fort Wayne, Ind.: I wish to agree with the essayist in the statement that the use of dionin in certain diseases of the eye is a distinct advance in ocular therapeutics. As I have already stated in a recently published article in the *Ophthalmic Record*, I am not as enthusiastic as Darier regarding the sphere of usefulness of dionin, but I believe that the remedy is applicable in the treatment of a certain class of cases, and in a few affections will be found more beneficial than any other one therapeutic measure.

The application of a five per cent. solution once in twenty-four hours, as employed by the essayist, is altogether too inefficient and I do not think will produce desired results. In fact, the history of the cases reported by the essayist do not indicate that the characteristic dionin effect was obtained, and the results secured could just as well be attributed to the other treatment employed. To obtain the best and most satisfactory effect from dionin a solution of not less than ten



per cent. in strength should be employed and the instillations should be made once in every one, two, or three hours according to reaction produced. As Darier has already pointed out, unless you get the characteristic infiltration and marked chemosis of the ocular conjunctiva, the action of the drug is practically nil. It has been my experience, and I have used dionin quite extensively, that when chemosis of the ocular conjunctiva does not occur, no benefit can be expected from the use of the drug.

Some patients and even some diseases seem more affected by dionin than others. In some cases even the pure powder seems to produce no appreciable reaction, and in some diseases even with the reaction no beneficial effect upon the inflammatory or degenerative process can be noted. I do not believe that it has any beneficial effect in cataract or degenerative affections of the chorioid or retina. For the promotion of absorption of exudates in the pupillary area, in the anterior chamber, or even in the vitreous, I believe it has a positive action which has been demonstrated to a certainty. In the various forms of keratitis the beneficial effect is questionable. In conjunction with atropine in the treatment of iritis, particularly when the pupil is more or less occluded and adhesions are stubborn, the results are generally marvelous. It not only favors dilatation of the pupil by promoting absorption of exudates, but has a distinct analgesic effect and limits or controls pain. Its analgesic effect also makes it of service in conjunction with eserine in the treatment of glaucoma. Its effect in promoting absorption makes its use after cataract extraction advisable if any cortical matter has been left. The solutions employed, however, should not be too weak if good results are to be secured, and care should be taken to obtain a reliable preparation, as therein lies the secret of success without ill effects.

To one unaccustomed to the effects of dionin the chemosis of the eyeball and lid, which at times is very marked, may appear to be dangerous, but no disastrous results need be feared. It is the lymphagogenic effect which is worthy of our recognition, but even if it had no other effect than that of an analgesic, it would prove a valuable addition to our

therapeutic resources in the treatment of many painful eye affections.

EUGENE SMITH, Detroit: I thought we had found a remedy when I read of this, but my experience is like Dr. Alt's in the hospital and in private practice. My patients all complained bitterly of the extreme suffering following a 5 per cent. solution, which lasted for hours. I imagine in one case I got some relief of the opacity. I probably did not use it long enough, but three or four weeks use caused me to throw it aside. In every instance I got the marked chemosis and such pain that the patients begged me not to use it. I used cocain previous to the use of dionin, and never found the slightest analgesic result, but the reverse. I have experimented for two or three months, as did my assistant, and we both cast it aside.

J. C. BUCKWALTER: I have had some experience, having used dionin on two different cases of glaucoma, and in both cases the pain produced was so severe that they could not continue the use of it. I ordered a 5 per cent. solution to be instilled every two hours. I performed a cataract operation, the results were perfect the first three days; after that the vision disappeared. The strength of atropine was increased from 1 to 2 per cent. to be instilled every two hours and hot applications made every two hours to continue for five minutes. This was kept up for three weeks with no improvement in vision and no clearing up of the exudate in the anterior chamber. I then ordered a 10 per cent. solution of dionin to be instilled every two hours for four days. The opacity cleared and the patient could count fingers at three feet. I have used the 5 per cent. solution in three different cases of macula of the cornea without perceptible improvement.

DR. BRIGGS: Some three years ago when Darier first published records of the efficacy of dionin, I used it extensively for some time, but I was a little sceptical, because I saw a number of other reports which seemed to prove it useful in almost every eye disease. When one finds a remedy vaunted as almost a universal medicine, he can generally conclude that it is not very useful for any disease. I have gradually used it less in the last year than I did the first year



that it was introduced and have restricted it of late to use an analgesic in cases of iritis. I occasionally use the powder, applying it to the cornea. My experience has been that it had very little influence on lesions of the cornea, but I do believe it is occasionally very beneficial in its effect on the pain of iritis. Its action is not uniform, in my experience, but it is so frequently disappointing that I have used it less and less.

GEO. F. SUKER: The efficacy of dionin in glaucoma is in proportion to the amount of tension. The pain caused by it depends largely upon its purity. The bi-products are often irritating and, unless chemically pure, it will cause a considerable amount of pain. The purest will cause some pain, but not more than some other solutions we use at the present time. It should be preceded by cocain. It does enhance the efficacy of the dilating property of atropine, especially so in syphilitic iritis with adhesions. It materially aids in absorbing the exudative materials. In cataract extraction where you have a cloudiness left in the anterior chamber because of flocculent lens remains, application of it does enhance the absorption because it is a decided lymphagogue. I use one drop of cocain first and then the 5 per cent. solution of dionin—never stronger than that—a drop every hour or so, into the conjunctival sac, until there is a marked chemosis, and then add one more drop for safety. Then I allow the patient to rest and, if necessary, apply iced compresses to counteract the extreme chemosis. As to its analgesic effect, I am undecided. As regards its lymphagogic action, it is certainly a decided addition to our therapeutics in ophthalmic practice.

H. V. WÜRDEMANN: The testimony given by the several deponents in this case seems to show that this affiant, dionin, is on trial for its life. My experience with it for the past two years is that it is a positive analgesic, antiseptic, local alterative, and a lymphagogic of strong action. Its effect is only to be gained in strong solutions of the pure drug applied frequently. Its affect passes away and cannot be obtained again for three or four days, so that we have to have an interval before we can get an effect with this drug again.

This effect depends upon the amount of reaction we get, the amount of chemosis or exosmosis produced.

MELVILLE BLACK, Denver: I am skeptical about the value of a new drug, and I am like the man from Missouri, "I've got to be showed." But I have been agreeably disappointed in dionin. It certainly has met the claims of those who have been its strongest advocates. I am surprised there should be this extreme difference of opinion. Those who have been disappointed in it seem to have gotten no results at all, while others find it a very valuable agent. However, we all differ in the way we use drugs, and drugs differ in their strength, in accordance with the manufacture. It would seem that those who are getting results are using a different preparation from those who get none or are using it differently. Würdemann has struck the key-note when he says the greatest effect is in the beginning. If one watches it closely he will find the greatest chemosis from the first application. The chemosis gradually subsides and becomes less and less in subsequent applications. It seems to me every two hours is too often to use the drug, because we do not get complete recession of the chemosis in the interval and in consequence the drug soon ceases to produce any reaction. I use it every five or six hours for a number of days. As soon as it ceases to cause reaction, stop it for a few days, and then begin its use again. We will get a more prolonged action if it is not used too frequently. It seems to me it would be well to bear this fact in mind, that if you wish to prolong the action of this drug, you must not use it every two hours. In chronic cases I have used it two days on and two days off. By so doing the reaction it produces can be seen for several weeks.

J. M. RAY: One point in connection with the use of dionin brought to my mind by the last two speakers is in regard to the thickening of the conjunctiva, while the chemosis will disappear in a few hours, there is a soggy, water-logged appearance of the conjunctiva for several days. In several cases I have seen a certain amount of extravasation of blood into the tissues under conjunctiva, and this remains a day or two.



DR. HOOD (closing discussion): I did not wish to convey the idea by these few cases reported that dionin is a cure-all. It is not. Only perhaps three or four classes of cases were represented by the cases reported, and the point mentioned by my friend Dr. Bulson in regard to testing the susceptibility of the eye of the individual is one I would emphasize. You must have the chemosis or there is not much effect, analgesic or otherwise. I feel gratified that the paper elicited the full discussion that it has. I think we are advancing in our knowledge of this drug, and I hope the reports we may get will soon settle its status.

## SOME UNIQUE CASES OF AMBLYOPIA.

DR. T. W. MOORE,

HUNTINGTON, WEST VA.

At the time I selected this subject, I did so to report three cases of transient amblyopia without fundus changes occurring in children between the ages of ten and eighteen, presenting no special features of nervous debility and without neurotic family histories.

Since that time Dr. L. Webster Fox has reported several cases of the same type under the title *Anaesthesia of the Retina*, in a paper read before the ophthalmological section of the American Medical Association. His patients were all young girls, who were healthy and all were cured after a few applications of the constant electrical current.

Case 1 of my series came to me in March, 1903, complaining of having suddenly lost her vision, being unable to see either far or near, and having been compelled to give up her schoolwork on this account. I found a healthy, active, full blooded girl, aged eleven years. Pupils reacted normally, vision in each eye = 10/200, accepting no lenses. Under

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\*Read at the Meeting of Amer. Acad. of Ophth. and Oto-Laryng. Aug. 26, 1904.

atropine, vision remained the same, but with a  $+ .50 \text{ C} + .50$  cyl. ax.  $90^\circ$  over each eye she read 20/80. Her field for white was contracted in all directions as it was for colors, the normal relationship being retained, a second examination at this time remained practically the same. The media and fundus were normal in both eyes.

I gave strychnia, and iodide of sodium, with instructions for patient to return in three weeks. I received word that she was much better but did not see her again until December, when I found her condition practically unchanged. This continued until after my return from the meeting of the American Medical Association, when I began using the galvanic current for five or six minutes daily, the sponge electrode being moved across the forehead and over the closed lids and temples. Her vision when I began treatment was R. E. 10/150; L. E. 5/150, she being unable to read 11 Jaeger near. I tested her with different cards at different distances and obtained always the same results, although she did at times complain of being unable to see anything, but after a few minutes rest she would read the letters to the limit of her vision. On June 23rd, 1904, after using the current five minutes, vision improved from 14/200 in R. E. to 20/200; in L. E. from 7/200 to 10/120. On June 24th, after using the current five minutes the vision was the same as the day before. On June 25th, after using the current five minutes vision = 20/80 with both eyes. Patient was taken to the country on this date, returning on the 30th, when after using the current five minutes she read 15/50 with both eyes. On July 2nd, after six minutes treatment she read 15/20 with both eyes; on the 5th 15/15, on the 7th 15/15 +, reading Jaeger 1 at twelve inches. Fields normal. Repeated measurements of the field of vision showed that there was an increase in all directions as the vision improved, the field for red increasing also but retaining its normal relation in the left eye, but in the right eye the field was never as much contracted as in the left, retaining almost its normal size at all times.

Case 2.—S. P. Schoolgirl, aged 17, came to me in January, 1903. Vision, R. E. 20/200; L. E. 20/120, unimproved by glasses. Retinoscopy showed the refraction to be  $+ .50$



sp. R. E.; + .25 sp. L. E. Patient went to the springs and returned with vision, R. E. 20/120; L. E. 20/40, this was eight months later. One month later with + .50 vision = 20/30 in each eye. There was at no time any abnormality in the media, the only symptoms being failure of vision, sensitiveness to light and the contracted fields.

This case was of especial interest to me because a brother six years before had been examined by a well known ophthalmologist who made a diagnosis of disease of the optic nerve that would lead to total blindness in a short time, and to my knowledge the patient had to be led about for several months, and was finally cured by "blood medicine" compounded by an uncle who calls himself an eclectic.

Case 3 was a boy aged ten, inclined to be nervous without any special manifestations. Parents healthy as are his brothers and sisters. No headache, vision suddenly failed so that he was unable to study, vision = 20/40 unimproved in both eyes when first seen, June 7, 1902. A few weeks later his vision was 20/20 both eyes—three letters. On August 21, it was 20/60 both eyes, nine days later it was 20/30? both eyes. One year later he was no better. His fields were contracted when the vision was bad, the normal color relationship being maintained and normal when he read 20/20. Ophthalmoscopic findings were at all times normal.

Heretofore, gentlemen, it has been the custom of ophthalmologists to classify these cases as belonging to that symptom complex "hysterical amblyopia," and as that term has been used to designate every visual defect that could not be explained by pathological findings—I suppose that it is the correct one—and further it lessens the shock to our sensibilities by having it gradually dawn upon us "that there is something wrong and we do not know what it is."

I wish to emphasize a few points in my cases in which they differed from the usual hysterical manifestations.

First, the fields for white in these cases have varied with the visual acuity instead of being contracted disproportionately, and the color limits have retained their normal relationship instead of being reversed as they so frequently are in the neurasthenic types.

My cases as well as those reported by Dr. Fox all oc

curred between the ages of ten and eighteen years—the ages when hysterical symptoms are most prone to manifest themselves, and whilst all of his and two of my cases were in females, it is known that the members of that sex do apply themselves to their books more assiduously than their brothers.

Hysteria is so frequently monocular, in these cases both eyes were involved and to almost the same degree.

I made very careful tests in Case one to determine as to the counter field described by Wilbrand and found it absent, and further the fact that my cases and those of Fox occurred in young subjects and not in hysterical women with ovarian and uterine disorders, as he states his cases were most frequently found.

If neurasthenia is abnormal susceptibility of the system to fatigue from mental or bodily exertion, this broad term may express the origin of this condition which I believe to be an arrest of the functional activity of certain retinal cells occurring at or about the time of puberty, when the entire nervous system is at high tension and when with our forcing system of education the eyes are apt to be overworked, more particularly in those subjects who have slight refractive errors for the reason that they receive no warning in the way of headaches, etc.

The remedy for this from Fox's report and my experience with the one case, after other measures had failed, is the constant current which seems to stimulate these torpid cells into renewed activity.

I do not think that retinal anæsthesia is a good term owing to its use by different authors for varying conditions none of which were in accord with the symptoms here described, Retinal Torpor might be a better one.



## COFFEE AMBLYOPIA.\*

BY ALBERT E. BULSON, JR., B. S.; M. D.,

FORT WAYNE, IND.

Among the substances which may, through toxic action, produce amblyopic symptoms, unaccompanied by demonstrable retinal or optic nerve lesions, coffee may be included, though ophthalmological literature contains but few and brief references to the subject. Among modern writers de Schweinitz (1) Ball (2) Wood (3) and a few others mention coffee as capable of producing toxic amblyopia, but no particulars are given. Hutchinson (4) reports having seen a case of coffee amblyopia which resembled quinine amblyopia, while Wing (5) reports in full, with perimetric charts, the history of an exceptional case of coffee amblyopia in a patient but eight years of age.

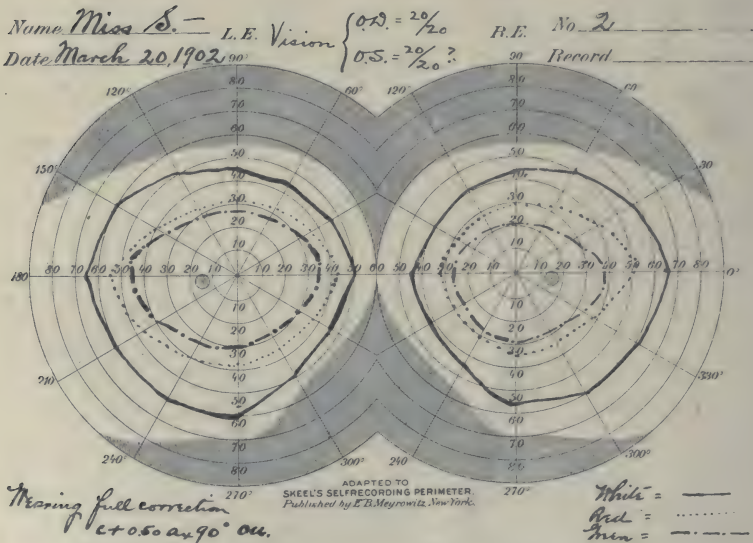
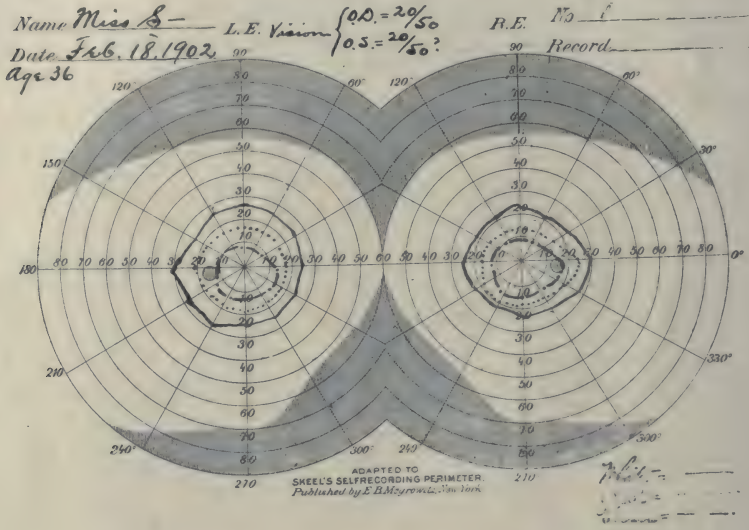
The experiments and observations of the writer seem to warrant the belief that visual disturbances of mild form as a direct result of the use of coffee are relatively more common than generally supposed, and that pronounced amblyopia, with contracted visual fields, in those who use coffee to excess, is not a rare condition.

The manner in which the visual disturbance is produced is somewhat in doubt, though the theory advanced by Casey Wood (6) that it is occasioned by a ptomain poisoning generated as a direct result of the injurious influence of excessive quantities of coffee taken into the system, seems worthy of acceptance. While Luederitz (7) Rabateau and several other observers have been able to definitely establish the fact that infusions of coffee have the power to destroy various pathogenic and non-pathogenic micro-organisms, and when taken internally in certain quantities act as an agent to restrict the growth of pathogenic organisms in the intestinal canal, it is equally an established fact that the excessive use of infusions of coffee produces a marked irritation of the digestive tract, thus favoring the processes of decomposition

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\*Read at the Meeting of Amer. Acad. of Ophth. and Oto-Laryng. Aug. 26, 1904.

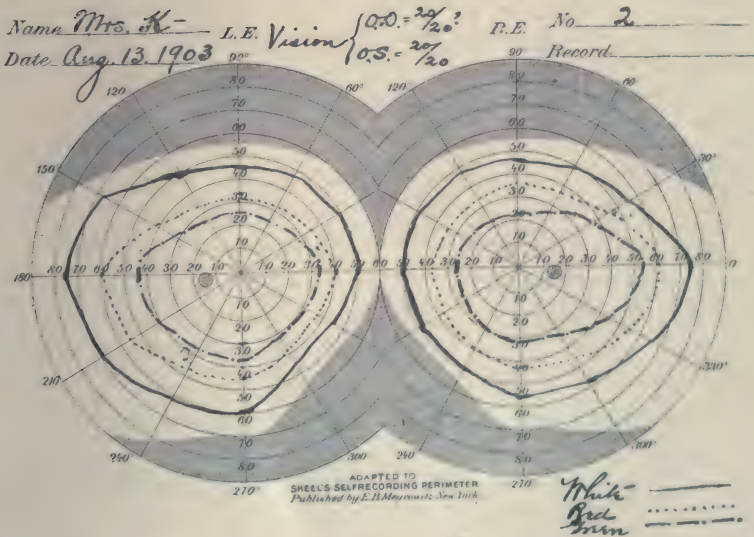
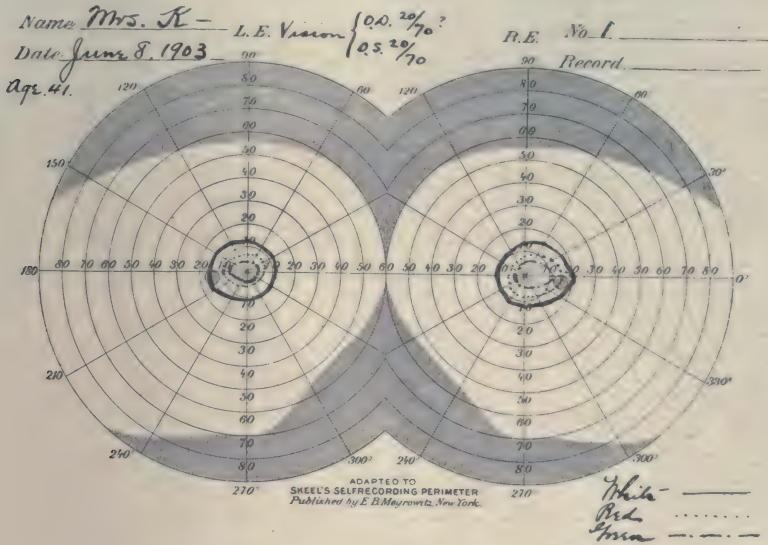
and disintegration essential to ptomain development, and this is more particularly true in those persons having a particular



susceptibility to its effects. That the ptomains thus generated, acting through the circulation, may produce nutritive changes in the ganglion cells of the retina, or an affection of



the optic nerve, or both, seems a reasonable supposition as to the genesis of the visual disturbances accompanying the excessive use of coffee by certain persons.



The writer's attention was first directed to the subject of amblyopia as produced by coffee by the following case:

Miss S—, dressmaker, age 36, consulted me Feb. 18,

1902, with a history of failing vision dating back three months. On the supposition that glasses were all that was required for relief, a local optician had prescribed concave sphericals of one-half dioptre without beneficial effect. On examination vision was found to be 20/50 each eye, and not improved by lenses. Conjunctiva, cornea and iris normal. Ophthalmoscopic examination negative. A test of the field of vision disclosed concentric contraction of the field in each eye for all colors, as indicated by the perimeter chart, but with no discoverable scotomata.

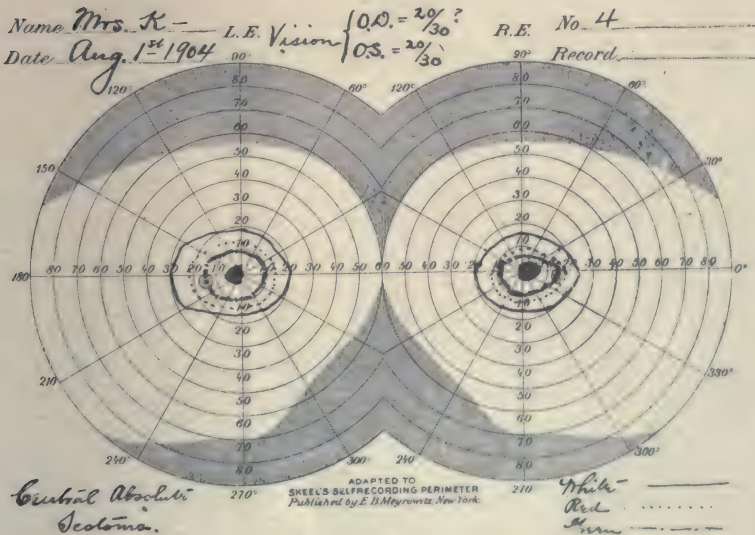
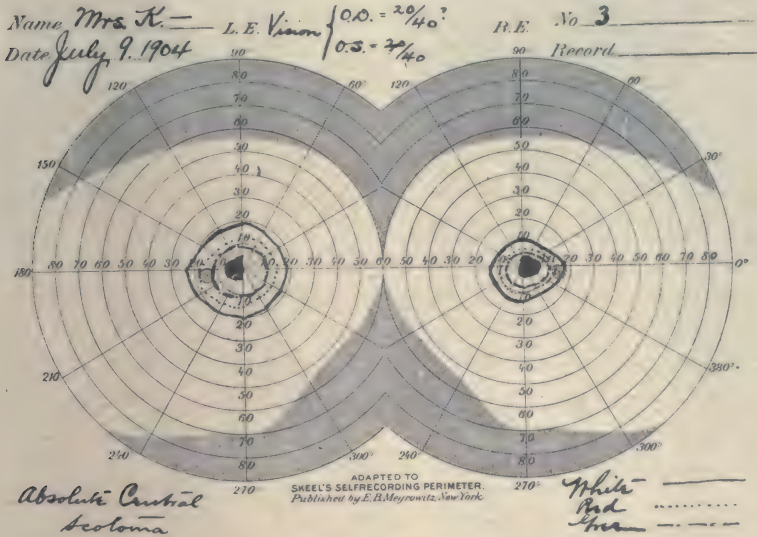
Upon questioning the patient the fact was brought out that for several months large quantities of strong coffee, averaging ten to twelve cups per day, had been drunk, much of it during working hours when it was taken in place of the mid-day meal. The patient also suffered from poor appetite, disturbed digestion, constipation, and marked nervousness. admitted that for two months she had been drinking coffee again, and of late in quantities nearly as large as formerly. There had also been a return of the headaches, eye pain. Headaches and attacks of "dazzled vision" were of almost daily occurrence. Examination of the urine negative.

The patient was directed to totally abstain from the use of coffee, and was given pilocarpine sweats, and daily hypodermic injections of strychnine in increasing doses, beginning with 1/20 grain. At the end of one week the vision had increased to 20/30 plus, and the fields had decidedly widened. At this time the pilocarpine treatment was discontinued, but the strychnine was continued in doses of 1/20 grain, in tablet form, after each meal. At the end of four weeks the fields of vision were approximately normal, and vision 20/20 each eye. The digestion and condition of the bowels had also improved. Patient then disappeared from observation and was not again seen until four weeks ago when she returned by request for report as to condition. There has been no return of the trouble. The use of coffee has not been resumed.

A more definite proof of the fact that coffee may be responsible for visual disturbance was found in the history of the following case in which a relapse occurred as a direct result of the resumption of the use of coffee:



Mrs. K., housewife, age 41, consulted me June 8, 1903. She reported that for several months she had noticed im-



paired vision but that the condition had grown much worse during the previous three or four weeks. During the latter period she had suffered from nervousness, headaches, poor

appetite, and indigestion. Also complained of attacks of violent twitching of the eye-lids, accompanied by spots before the eyes. Patient reported that for two or three years she had been accustomed to drinking large quantities of strong coffee which she took at varying intervals during the day from the coffee pot which was constantly kept filled and on the stove. She said she depended upon coffee to sustain her.

On examination both eyes were found fairly normal in appearance, with the exception that the pupil reacted a little slowly to light and accommodation. Vision 20/70 each eye, and not improved with lenses. Media clear. Fundus of each eye presented a slight pallor of the temporal half of the disc, and haziness of the edges, but otherwise normal. Field of vision in each eye decidedly contracted concentrically for all colors, as indicated on the perimeter chart, but no scotomata. Examination of the urine negative.

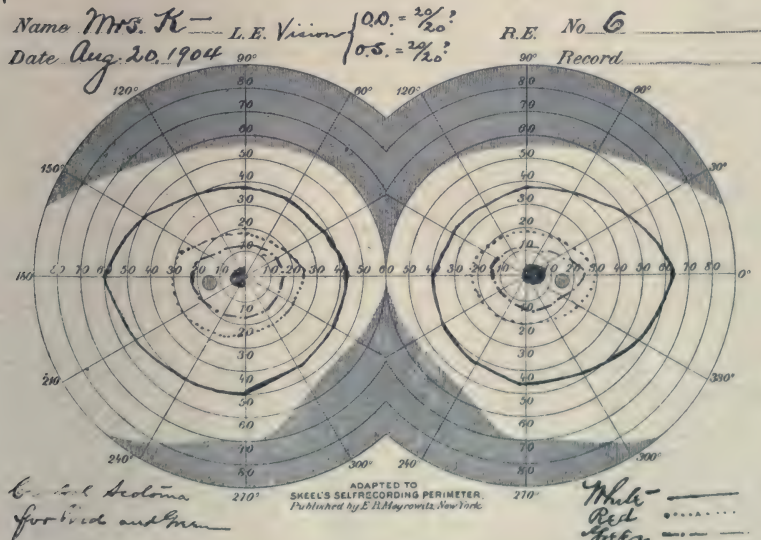
The patient was directed to abstain from the use of coffee, and pilocarpine sweats and strychnine were prescribed. Under the treatment the vision steadily improved and the fields of vision widened until on August 13th, when the patient was discharged, the conditions were essentially normal.

The patient was not seen again until July 9, 1904, when she returned complaining that her vision had within two or three weeks become affected much as it was at the time of the first consultation over one year before. She reluctantly admitted that for two months she had been drinking coffee again, and of late the quantities nearly as large as formerly. There had also been a return of the headaches, eye pain upon use of the eyes, and "flashes of light." Vision 20/40 each eye, and fields contracted essentially to the same extent as in the former experience. At this time a small absolute central scotoma was discovered.

The patient was again placed on treatment consisting of pilocarpine sweats, strychnine, and abandonment of the use of coffee. Improvement was slower than in the first attack, and at the end of three weeks vision had only increased to 20/30, fields of vision had not widened to any great extent and the central absolute scotoma persisted. At a recent



examination, Aug. 12, 1904, the vision was 20/20 minus in each eye, the fields of vision increased to about one-half



normal, and the central scotoma changed to one for red and green only. The patient is continuing the same treatment, with the addition of potassium iodide in 15 grain doses.

In view of the discovery of a small central scotoma in the last case during the second attack, it is reasonable to presume the possibility of the existence of a similar manifestation during the first attack, and perhaps also in the first case reported, but overlooked owing to lack of extreme care in the perimetric examination.

These two cases of coffee amblyopia, coming under observation within a few months of each other, led the writer to undertake a series of experiments upon himself, and observations with reference thereto, as to the toxic effect of coffee upon the visual apparatus. It had long been known that the subject was particularly susceptible to the influence of strong coffee in certain quantities not usually considered excessive. An attempt was made, therefore, to induce, if possible, a mild coffee amblyopia. Beginning with the addition of four to six cups of strong coffee to the usual allowance of one or two cups of moderately strong coffee taken at the morning meal, the quantity taken per day was rapidly increased until it exceeded twelve cups. At the end of two weeks the use of coffee was discontinued on account of excessive nervousness, persistent insomnia, anorexia, gastro-intestinal disturbances, and dull headache. During the first week of the test nictitation developed and increased in persistence until at the end of an additional five or six days it became almost unbearable, and undoubtedly contributed to the general nervousness. There were also asthenopic symptoms upon prolonged eye-work. Visual acuity was not affected until the day the test was abandoned, when the usual 20/15 vision for each eye was found to be barely 20/20. The field of vision in each eye however, was found contracted concentrically to an appreciable degree three days before the use of coffee was abandoned, and the contraction slightly increased during the succeeding three days. Careful and painstaking perimetric examination failed to disclose the existence of scotomata. Only two fundus examinations were made, by a confrère, and at neither examination could there positively be detected any injection of the retinal vessels, though the temporal half of each disc appeared to have a slight pallor and the edges of the discs were somewhat hazy. With the suspension of coffee drinking the disagreeable symptoms disappeared, but



return to normal conditions was probably hastened by strychnine  $1/20$  grain, three times per day, which it was deemed wise to take in view of the general nervous debility existing.

A peculiar feature in the experience was the quieting effect which tobacco had upon the irritable nervous system. When affected with a general nervousness which precluded the possibility of being quiet for even a short period of time, the smoking of a cigar had a decided quieting effect. The possibility of tobacco being a factor in the case is recognized, but in view of the cessation of the ocular manifestations following the withdrawal of the coffee, it seems reasonable to suppose that the coffee was responsible for the mild amblyopia.

Hutchinson reported that his case resembled quinine amblyopia, in which case there presumably was marked contraction of the retinal bloodvessels and pallor of the discs. In Wing's (9) case there was congestion of the optic discs, enlargement of the retinal veins but contraction of the arteries. In the two cases observed by the writer, one of which was seen during a recurrence, no perceptible contraction of the retinal vessels could be distinguished, and aside from a slight pallor of the temporal half of the discs and faint haziness of the edges of the discs there were no fundus changes discoverable by ophthalmoscopic examination.

It is presumed that with more extended observation in a larger number of cases the manifestations will vary, much as the manifestations vary in tobacco amblyopia. The more important point to be considered is the recognition of the possibility of coffee being the cause of a toxic amblyopia as well as many of the asthenopic symptoms which at times seem of obscure origin. Considering the almost universal use of coffee as a beverage it is thought that cases of coffee amblyopia are not relatively uncommon, but when occurring will be found in persons particularly susceptible to the toxic influence of coffee when taken to excess. It is also thought by the writer that women, with their more sensitive nervous systems, mode of living, and increased tendency to use such beverages as tea and coffee to excess, will be found most often suffering from the affection. Such cases, judging from observations made, will probably be also accompanied in nearly every instance by gastro-intestinal disturbances,

and various neurasthenic manifestations not the least of which will be asthenopia.

Treatment of the condition is obvious. The use of coffee should be discontinued. Elimination by means of the pilocarpine sweat seems of undoubted value, and this should be supplemented with strychnine internally in fairly large doses. The latter should be increased to the point of tolerance if central vision does not rapidly improve and the fields of vision widen. In the less pronounced cases discontinuance of the use of coffee alone may be sufficient to bring about improvement, and especially if proper dietary and hygienic regulations are followed.

Judging from the second case here reported it would seem that coffee amblyopia having once occurred, relapses may be occasioned by resumption of the use of the beverage in even moderate amounts.

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## ORIGINAL ARTICLES.

### DISCUSSION.

OF THE PAPERS BY DRs. MOORE AND BULSON.

DR. BRIGGS:—I have always called such cases as Dr. Moore describes hysterical amblyopias. I have usually seen them in school girls in debilitated condition from over study, and too little out-of-door exercise. In regard to the case spoken of by Dr. Bulson, I am very glad to hear the report, because it opens a new field. We have certainly overlooked a great many cases in the past. There are so many poisons taken into the human system as beverages or in some other form, alcohol, tobacco, coffee, and tea, that produce various nervous disturbances, and the nervous affections of the eye, I believe, are not infrequently produced by strong coffee and I have no doubt that coffee, even in small quantities, will have a more or less debilitating effect on the nervous system. I saw a patient last winter some time who had, during the evening that he was engaged in writing a paper, taken three cups of very strong black coffee, and in the night some time was taken with total deafness in his left ear and loss of power of locomotion. Whether the coffee had anything to do with the affection of the semi-circular canals is a question in my mind, but I have considerable leaning to the view that it may have precipitated the attack.

DUDLEY S. REYNOLDS: I think it was at the Cincinnati meeting of this Academy the subject of hysterical amblyopia was discussed, and I reported some cases occurring in my own practice which seemed to me were due to auto-intoxica-

tion, and I have since then had the opportunity of seeing a very strikingly illustrative case. I would like to suggest to Dr. Moore that he add the bitartrate of potassium to the pilocarpine treatment, and he will find more rapid recovery. I have lost confidence in the medical treatment of hysterical amblyopias engineered by disturbance of the genito-urinary apparatus in women. As to the effects of coffee I have reported several cases, and one striking case I have alluded to a number of times, and beg pardon for referring to it again. A lady about 42 years old, became gradually more and more amblyopic; the retinal arteries became contracted, the discs pale and the veins injected and at times tortuous. There were, also, ataxic symptoms and locomotion without a cane was finally impossible, and she gradually became so nervous as to take to her bed where she remained four or five years, refusing to give up coffee, and finally died with just enough light perception to enable her to distinguish large bodies, or the shadows of people walking through the room.

J. J. KYLE, Indianapolis, Ind.: I believe we have a great many cases of anaesthesia of the retina not dependent upon systematic conditions, diseases, neurasthenia, etc. I have had cases under observation, especially in women who suffered from painful affections of the eyes, which reacted quickly on the local application of electricity the negative pole to the eye and the positive pole to the neck. These were typical cases of amblyopia, not dependent on systematic conditions, and I think, as Dr. Moore says, we must differentiate between the different anaesthesias, as it were, of the retina.

GEO. F. SUKER: The term hysteria, in its broad sense, is a misnomer. It is hardly consistent with our conception of things to have a functional disturbance without some organic change somewhere. The idea of idiopathic disease is being rapidly eliminated from our category. With reference to the contracted field, as spoken of by Dr. Moore, I think the gun barrel vision described by Graefe of Berlin, corresponds to Dr. Moore's case. I think there are cases where you can have a concentric contraction for form and color (without inversion) and yet the acuity be reduced. I think that the field of hysterical amblyopia needs further investigation than we have given it up to the present day.



In regard to Dr. Bulson's paper, kindly pardon a personal allusion; I am a confirmed drinker of strong coffee, and can vouch for the fact coffee does often produce an amblyopia. When I drink it to excess, a good, strong cigar has the same effect upon me that Dr. Bulson sets forth in his paper.

DR. MOORE (closing): I have very little to say, except as I understand it the usual hysterical field for red is increased or normal, whilst that for white is contracted. In my cases the fields for both colors were contracted proportionately with the visual acuity, retaining their normal relationship. This was also true of the cases reported by Fox, all of which yielded to the galvanic current.

DR. BULSON (closing): I regret that the cases of coffee amblyopia reported by Dr. Reynolds did not come to my notice. I found in the literature at my command but little reference to the subject of coffee amblyopia, and what I did find was meager and devoid of particulars. Had I found any reference to Dr. Reynolds' cases I certainly would have mentioned the fact in my paper.

We are beginning to recognize certain toxic amblyopias which formerly escaped our attention, and I believe we will eventually distinguish coffee amblyopia as one of the relatively common amblyopias, even though the alteration in the state of the vision in the majority of such cases is slight. The two cases observed by me did not bring out any specific symptomatology other than the amblyopia and the contraction of the fields of vision. It is likely, however, that eventually we will have a series of manifestations which definitely point to coffee as being the cause of the trouble, just as we recognize by certain manifestations the amblyopia from tobacco, hysteria, etc. In one of my cases the diagnosis was made largely by exclusion, and in the other the diagnosis by exclusion was strengthened by the recurrence of the amblyopia when the use of coffee was resumed.

In experimenting upon myself I took advantage of a long recognized sensitiveness to the effects of strong coffee. For several years I have not been able to drink coffee at the evening meal without suffering from wakefulness during the early  
1 a of the night. The production of visual disturbance seemed possible, and with that end in view the experiment

was undertaken. No doubt the amblyopia produced would have been more pronounced had the use of coffee in large quantities been longer continued, but the resulting nervousness and gastro-intestinal disturbance was so annoying that I felt compelled to abandon the test. A very appreciable contraction of the visual fields and slight amblyopia was demonstrated before the conclusion of the test.

Dr. Reynolds speaks of congestion of the retinal veins and contraction of the arteries in the cases reported by him. I was not able to distinguish any features of this kind in either of my cases. The only variation in the appearance of the fundus noted was a slight pallor of the temporal half of the disc and faint haziness of the border of the disc. One of my confrères who made an ophthalmoscopic examination of my eyes during the height of the coffee toxæmia said that aside from a slight pallor of the temporal half of each disc there was a faint haziness over the entire retina of each eye, most pronounced at the margins of the discs. The haziness entirely disappeared following abandonment of the use of coffee.

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## THE USE OF PURE NITRIC ACID IN THE TREATMENT OF DISEASES OF THE EYE, ETC.\*

DR. J. W. BULLARD,

PAWNEE CITY, NEBRASKA.

I began the study of medicine in the office of my father who was an Eclectic, and in his library was a "Manual of Eye Surgery," by A. J. Howe, A.M. M.D., Prof. of Surgery in the Eclectic Medical Institute of Cincinnati, Ohio. In the chapters on Pterygium, Keratitis and Ulceration of the Cornea, the author speaks of the use of pure nitric acid in the treatment of these affections. It was here that I first re-

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\*Read at the Meeting of Amer. Acad. of Ophth. and Oto Laryng., Aug. 26, 1904.



ceived my inspiration in the use of nitric acid in the treatment of certain diseases of the eye.

In the discussion of Dr. Kipp's paper at the Saratoga meeting of the American Medical Association, when Serpiginous Ulceration of the Cornea was under consideration, Dr. Edward Jackson spoke of using it in 20 to 50 per cent. solution; Prof. Haab, who was present, spoke of using it pure, and Dr. R. L. Randolph, who followed Prof. Haab, also mentioned the "pure acid," but whether he referred to both nitric and carbolic or only carbolic, I am unable to say. In a paper read by the author before the Gage Co., Nebraska, Medical Society and published in the *Western Medical Review*, on "Ulcers of the Cornea," its utility was incidentally mentioned. The author was present at the meeting of the Baltimore Medical and Surgical Society, in April 1902, when Dr. Theobald read a paper on the treatment of ulcers of the cornea with carbolic acid, and took part in the discussion, when he also advocated the use of pure nitric acid. Aside from these I do not know of any public mention having ever been made of the use of pure nitric acid in eye surgery.

Nitric acid is one of the most powerful escharotics in the mineral acid group, but as it coagulates the albumen of the tissues without redissolving it, it in this way safeguards its own excessive action. (Potter). It has always been recommended in phagedenic conditions in structures other than those of the eye. In eye surgery its action can be controlled to a nicety and in the great majority of cases is just as effectual as is the action of the actual cautery, possessing all the advantages of the latter and none of its disadvantages. You cannot, however, as is necessary in some serious cases of deep infected ulcers of the cornea with accompanying hypopyon, do a paracentesis with it as can be done with the cautery; neither can large masses of tissue be destroyed by it, but in the ordinary infected ulcers of the cornea, it will do all that the cautery will do, and with less inconvenience to both surgeon and patient. It is a very difficult matter to get some patients to be absolutely quiet while you are using the cautery, as they not only see the red hot electrode, but feel the heat. The acid is always handy, requires no apparatus, and does not fail you at the critical moment as is sometimes the case with

the cautery. The action is deeper than that of carbolic acid, but not too much so if used with proper care. It possesses the advantage over iodine, that it forms a zone of coagulated tissue around the ulcer, thus closing the lymph spaces which produces a barrier against the further invasion of the healthy tissues by the ever-present microorganisms. In short, it may be used in any condition of the eye in which a cauterant is needed, as it is sure destruction to all forms of germs, thus checking the onward march of the spreading ulcerative process which is dependent on the action of microorganisms.

The mode of application is as follows: a small piece of pine, I usually use the non-combustible end of a match-stick, is whittled to a blunt, not a sharp point, and dipped into the acid and held till all moisture has disappeared. There will still remain enough of the acid for use. The eye, which has been previously cleansed and cocainized, is held open by the thumb and index finger of the left hand, and the ulcer either wiped dry with a probe wrapped with sterile cotton, or if there is much debris, curetted, when with the acid stick the floor and edges of the ulcer are touched. It is important that the ulcer be dry, or at least, comparatively so. The application coagulates the tissues with which it comes in contact, causing them to turn white, thus it is an easy matter to watch the extent of the cauterization. In phlyctenular conjunctivitis I almost invariably touch the individual phlyctenules with the acid stick, and with the happiest results; one application usually being all that is necessary to terminate the attack. This does not interfere with the constitutional and local treatment which is usually necessary to carry out to prevent recurrence.

In operating for pterygium it is not always possible to remove all the growth from the cornea. The essayist is usually in the habit of touching this residual portion with the acid pencil thereby hastening the absorption. It sometimes happens after a pterygium operation that there are some loops of vessels thrown across onto the border of the cornea and the growth reforms. In this case, if the acid stick is drawn across the bundle of vessels, just before it reaches the cornea, and this process is repeated at intervals of four or five days, the blood supply is cut off and the growth disappears. In old



vascular conditions of the cornea the vessels may be obliterated in the same way.

In cases of fascicular ulcer of the cornea, and in fact in every and all conditions of either cornea or conjunctiva where a cauterant is needed it is the ideal remedy.

For the past twenty years the author has used the acid almost exclusively, very rarely resorting to the cautery, and with such success that I thought it advisable to present the matter before this body. I feel sure if any of my confrères will use it as I have outlined, they, too, will be delighted with its action.

#### DISCUSSION.

DUDLEY S. REYNOLDS: I will call attention to the fact that the late Mr. Dixon of London, mentioned the use of fuming nitric acid in certain conditions, including granulated lids, which included trachoma and conjunctivitis. Mr. Dixon's plan was to shave off with a razor the hypertrophied papillæ, and apply the fuming nitric acid with a glass brush. In the Holmes' System of Surgery I think some mention of it will be found. I am sure Sir William Lawrence used dilute nitric acid in the treatment of purulent ophthalmia, mention of this practice may be frequently found in the literature of seventy-five years ago.

GEO. F. SUKER: In the application of the nitric acid, especially of the fuming variety, it is important not to touch the healthy cornea. It is a good policy to instill olive oil in the eye and then wipe off the area to be touched, thus avoiding injury to the healthy cornea.

J. A. DONOVAN: The doctor speaks of nitric acid as doing nearly all the electric cautery will do. Since reading a paper before this society a year ago, I have used the cautery something like a hundred times. I have in three instances been obliged to use it the second time. I never had to repeat it more than the third time in any case. I can use the electric cautery in my office in less time than I could arrange this nitric acid, and feel safer. About the last fifty times, I used it at barely red heat. The black heat, just before the point of red, is safer, and as safe as anything possibly could be that

is efficient, and it also eliminates the feeling of heat in the cornea. Another thing, the nitric acid touches the floor of the ulcer, already deeper than you want, and of necessity makes it deeper; the cautery is used only at the edge. I consider the electric cautery the best method we have for treating ulcers.

J. A. L. BRADFIELD: I am an enthusiast for pure nitric acid and have been for the past ten years, and I most radically differ from what has just been said. Corneal ulcers can be treated with the least possible loss of tissue with nitric acid. An application can be made to the diseased portion and limited to that. It seems that many do not understand the use of the acid. Some, in using nitric acid as suggested by Dr. Reynolds, will get into serious trouble. The nitric acid is so powerful that we must be absolutely certain of what we are going to do. I use a hard tooth-pick instead of a match. By making the point to correspond with what you want to touch I have no trouble in getting exactly the effect desired and no more. Never let it be used until dried in the atmosphere.

A. ALT: I would like to ask Dr. Bullard whether he would use the nitric acid also in beginning epithelial cancer on the conjunctival limbus.

W. L. DAYTON, Lincoln, Neb.: I believe if the stick with which the nitric acid is to be applied is properly prepared there is no danger as pointed out by Dr. Suker. Wait until the moisture has gone and then prepare the stick, which should be cut off squarely at the bottom and not rounded or pointed. Dr. Bullard undoubtedly believes thoroughly in the use of nitric acid, as he requested me to apply it when I operated for him a few years ago. Since then I have used it a number of times on indolent ulcers. Where for any reason you do not care to use the cautery, nitric acid is a very excellent substance.

DR. BULLARD (closing discussion): In answer to Dr. Suker, I will say that I have never had to take any precautions against injuries from allowing the fumes of the acid to coming in contact with the cornea. Of course I allow the stick to become thoroughly dry before using it. I am glad to know that many of the members are using nitric acid. I am sorry



that some of the literature on the subject has escaped me, tho I looked it up pretty thoroughly as far as I had time. Dr. Donovan speaks of destroying more tissue by touching the bottom of the ulcer. I have never had any scar except where the tissue had been destroyed to such a depth already that scar tissue was inevitable, and besides I prefer to run the risk of destroying a little more tissue rather than allow the destructive process to cause perforation of the cornea. In answer to Dr. Alt, who asks if I would use the acid in epitheliomata of the conjunctiva, while I have had no experience along this line yet I should not hesitate to do so, and I believe with good results. Dr. Dayton says I have the courage of my convictions. He operated on my right eye for pterygium, and I requested him to make the application on the cornea, and my pterygium, which was a bad one, has never troubled me since. I have been enthusiastic in the use of the acid. I cannot conceive the idea of getting sufficient heat in the electrode to cauterize the ulcer and the patient not feel the heat, if not on the cornea then on the lids. It may be that I have not used the cautery enough to be experienced, but I have been so thoroughly satisfied with the acid that I have not thought it necessary.

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## FURTHER EXPERIENCE AND TREATMENT OF KERATOCONUS.\*

J. A. L. BRADFELD, M. D.

LA CROSSE, WIS.

Keratoconus as a disease which has advanced till a well-formed cone is present, is very rare. If the atonic condition of the cornea which allows that membrane to lose its normal curvature irregularly, which is always the condition in the early development of the cone is called keratoconus, then keratoconus is a fairly frequent disease.

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\*Read at the Meeting of Amer. Acad. of Ophth. and Oto-Laryng., Aug. 26, 1904.

Observation convinces me the latter proposition is true. The most important aetiological factor is a fault in the general nutrition; secondary, eye strain (as over-use), bad light, unsteady position and errors of refraction. When the softened cornea gives way the resulting irregular astigmatism causes eye strain, which greatly hastens the progress of the disease.

The fault in the general system is often one which is self-correcting. Should this occur in the early stages of the disease we have only the slight ectasia as a mark of its existence. While if the cornea has proper attention at this stage no evidence whatever may remain. Should the disease continue until the area of affected cornea protrudes, a well-formed cone exists and a corresponding thinning of the apex takes place, only palliation is possible and good vision never restored.

Incipient keratoconus is always accompanied by failing vision and usually by asthenopia. When increasing myopic astigmatism is found with a variation of the axes with the principal meridians not at right angles, a positive diagnosis of keratoconus may be made.

Were the name kerato-atonía substituted for keratoconus the disease would much oftener be diagnosed at the stage where cure is possible.

#### TREATMENT.

Correction of any fault in the general system, rest of the eyes, correction of errors of refraction, before the ectasia has advanced until the cornea has become thinned, local application of the sulphate of alum to the diseased cornea. When a well-formed cone is present, cauterization of the apex of the cone with broad, low heated galvanic electrode, with subsequent iridectomy for visual purposes. Myotics and iridectomies as practised for glaucoma are valuable before the cone has advanced till it markedly protrudes.

To illustrate what may be done at the different stages of the disease, I report the following cases:

*Case 1.* Mrs. F., age 36, married, neurasthenic. Vision failing several years and eyes so irritable as to be unable to use them for a year. Two month ago left became very pain-



ful, congested and almost blind. Right eye sympathised to such an extent as to be unable to see to get about alone. Examination revealed well-developed cone on right eye and marked cone with ulceration of the apex in the left eye. Patient was put on tonics and nerve sedatives. Ulcerating apex of left thoroughly cauterized perforating the membrane. But little reaction and pain greatly lessened. Compress bandage kept on three weeks when wound was well healed and cone greatly reduced in size. Two months later made iridectomy in each eye, section reaching to the periphery, after which the eyes became quiet and revealing vision O. D. V 20/200; 20/120 W. + 3.00  $\bigcirc$  — 8.00. ax. 75. O. S. V = Counting fingers ten feet, improved by minus lens. After a year she reports eyes feeling much better and able to do all ordinary house duties.

*Case 2.* Mr. C., aged 19, stenographer. Seen first June 23, 1901. Appearance of general health good but had been rachitic when younger. For last year eyes had been irritable and vision failing for distance. Ophthalmometer showed 1  $\frac{1}{2}$  D. ax. 55 or 150 in right eye and 1 D. ax. 45 with slight irregularity in left. O. D. V = 20/80 : 20/25 W — 1.50  $\bigcirc$  — 1.50 ax. 50. S. V. = 20/60; 20/15 — W — 1.00  $\bigcirc$  — .75 ax. 0.

*Diagnosis.*—Kerotoconus and advised glasses, change of work and treatment.

Aug. 18th, 1901, the following conditions present: O. D. V = 20/60; 26/25 W. — 50  $\bigcirc$  — 100 ax. 90. O. S. V = 20/25; 20/80 — W. — 1.00  $\bigcirc$  — .75 x 90 which was prescribed. Referred to family physician for general care and work changed to shipping clerk. Began treatment of cornea by local application of crystals of alum sulphate three times a week, which was continued till Feb. 8th, 1902, when ophthalmometry showed 1  $\frac{1}{2}$  D. ax. 60 in right, and 1  $\frac{1}{2}$  D. ax. 60 or 160 in left eye. O. D. V = 20/60; 20/25 W — 1.50 ax. 120. O. S. V. = 20/40; 20/25 W — 125 ax. 0, which correction was prescribed. Local treatment continued till July 5th, 1902, but less frequent, when ophthalmometry showed O. D. 2  $\frac{1}{2}$  D. ax. 45 and O. S. 1  $\frac{1}{4}$  ax. 135. O. D. V. = 20/60; 20/25 W. — 75  $\bigcirc$  — 2.00 ax. 100. O. S. V; = 20/60; 20/20 W. — .75 accepting C. X. O. Dec. 7, 1902. Ophthalmometry O. D. 4 D ax. 140, O. S. 2  $\frac{1}{2}$  ax. 140 O. D. V =

20/120; 20/40 W. — S.  $\subset$  — 2.50 ax. .75. O. S. V = 20/25 AC + 50.

Alum again used quite regularly, also eserine in right eye till May 25th, 1903, when ophthalmometry showed O. D. 6 D, ax. 50 or 145, O. D. V = 20/00; 20/60 W. + 4.00  $\subset$  6.00 ax. 80. O. S. V = 20/25 AC + 1.00. Patient's work now called him from the city. Prescribed eserine in right eye and collyrium of four per cent. alum sulph. in each eye three times a day. May 29th, 1904, he returned with the following conditions: Slight cone of right cornea. O. D. V = 20/200; 20/80 W. — 8.00  $\subset$  — 5.00 ax. 55. O. S. V = 20/25 AC + 1.50. For last few months the error of refraction has not been corrected in the right eye. He is doing a good deal of writing and bookkeeping and the eyes are very comfortable. I believe an iridectomy should have been made in the right eye when the myopia began to develop but was positively refused. Cauterization will probably be necessary in a few months.

*Case 3.* March 30, 1902, Mr. B., mail clerk, aged 35. Vision of right eye very poor and left irritable on use. Slight ciliary and conjunctival irritation. Ophthalmometry showed O. D. 1 D. ax. 90 or 165. O. S. 1 D. ax. 25 or 105. O. D. V = 20/60; 20/20 W + 25  $\subset$  — 1.50 ax. 0. O. S. V = 20/25; 20/20 W. + 25  $\subset$  — .75 ax. 105, which was prescribed, and diagnosis of keratoconus made.

April 22, 1903, ophthalmometry showed O. D. V — 20/60; 20/20 W. + .75  $\subset$  — 2.00 ax. 0. O. S. V = 20/20; 20/15 W. + .75  $\subset$  — 100 x 125. Correction given and alum sulph. applications made twice a week till Aug. 14, 1903, when O. D. V = 20/60, 20/25 — W. + 1.25  $\subset$  = 125 x 0. O. S. V = 20/15 — AC + 25. Eyes feeling well and works with perfect comfort. Aug., '04, refractions practically the same and eyes perfectly comfortable.

*Case 4.* Feb. 9, 1899, Mrs. D., consulted me for asthenopia; when found following conditions: External muscles and corneae normal, O. D. V = 20/25; 20/20 W. + 1.00 in each eye. Presbyopia + 1.75. Sept. '02, saw her again when vision and refraction were same but requiring + 2.50 D. for reading. During last few years had good deal of sickness in family and kept very tired all the time. April 1,



1904, called on me with following history: Lost husband a year ago and since very nervous. Last Jan. had grippe; eyes became congested, painful and vision poor. Was treated for conjunctivitis till consulting another doctor who recognised something more serious and sent her to me. I anticipated glaucoma but found tension normal, general health below par and excretion of urinary solids below normal. Marked ciliary and conjunctival irritation. Cornea soft and reflex very poor. Ophthalmometry showed O. D,  $1\frac{1}{2}$  D. ax. against the rule and quite irregular O. D. V = 20/80 not imp. by g. O. S. V 20/80 not much improved by glasses. Diagnosis, keratoconus.

#### TREATMENT.

Diuretics followed by tonics; locally positive galvanism over palpebrum, and alum sulph. to cornea once a day.

April 26th, the conjunctival and ciliary congestion gone. Corneal curvature normal. O. D. V 20/40; 20/25 W. + .75. O. S. V 20/40; 20/25 W. + 1.00. Eyes quiet. Gave collyrium of four per cent. alum sulph.

Aug. 4th. Vision and refraction were same. The old asthenopia still remaining.

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## THE REAL PRINCIPLE OF TEST-TYPE CONSTRUCTION.\*

BY B. ALEX. RANDALL, M. A., M. D., PH. D.,

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The principle of test-type construction was laid down by Snellen in 1862, that roman capital letters, whose height subtends at the chosen distance an angle of 5' and with lines and interspaces one-fifth of this height constitute a fair average test for visual acuity. These tests were based upon the

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visual angle as defined by Scheiner in 1600. While, as shown by Booke in 1705, stars can be distinguished when some 30" apart, and wires or rods under an angle of about 50", (Helmholtz), the short member of the block-letter must have interspaces of 60" to be clearly defined. This affords a retinal image of some .004 mm., and perception of form prob-

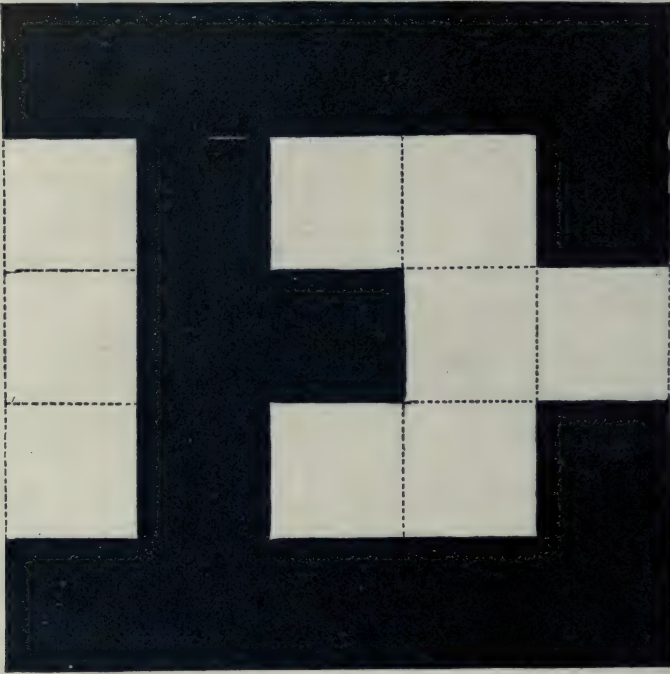


Fig. 1.

Green and Snellen's Test-Type.

ably depends upon excitation and nonexcitation of the adjacent cones of the macular region, with the size of which this closely corresponds. The sure recognition of an interspace seems to demand the presence of at least one unexcited cone between those affected. This standard, which holds fully for parallel lines or letters of like readiness of recognition, is fairly maintained as to strictly comparable figures, such as



the "haken" of Snellen; but it fails utterly when dots to the number of 5 or 6, separated by their own breadth, are to be distinguished. Experiment shows that the dots can be counted

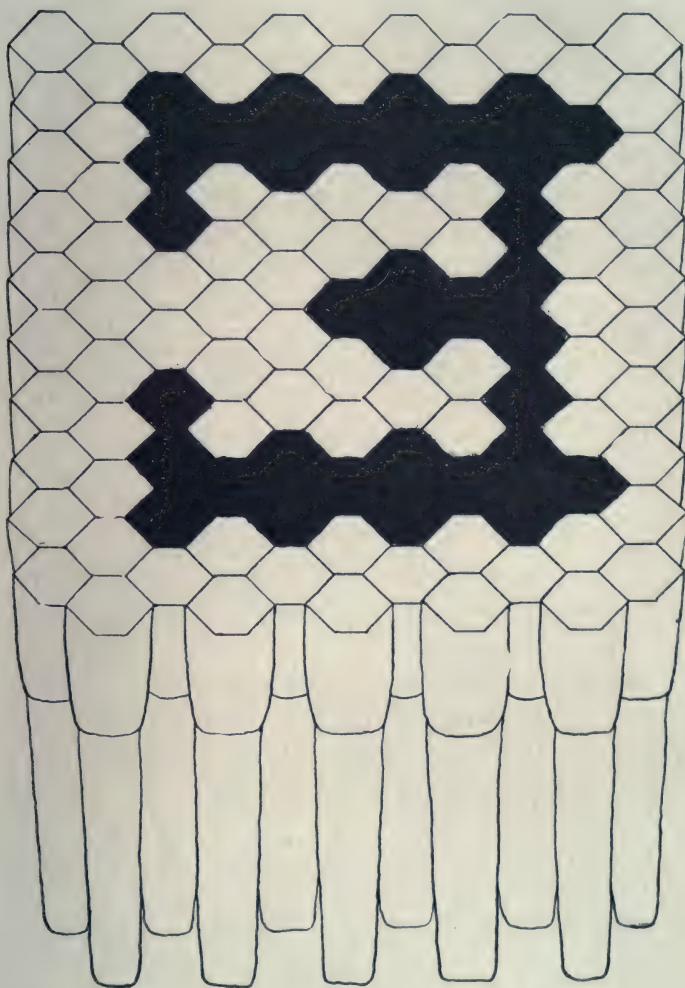


Fig. 2.  
Retinal Image on the Macular Cones.

only when each subtends an angle of nearly  $2\frac{1}{4}''$ , as set forth by Burchardt in his "Internationale-Sehproben," 1868, and by others who found that Snellen's dots on the scale of

his type for 50 feet were just fairly seen at 20 feet. Snellen, therefore, abandoned the dots rather than amend his principle, which even in his letter writings he terms the "5' letter."

John Green improved the sequences of the distances for which he constructed letters, giving each the constant ratio of 0.795 to the next larger letters; but he used a simple Gothic letter with strokes subtending 1' but with interspaces often three times as great. (Trans. Amer. Ophth. Soc., 1868). Hence his letters were too easily read; and Wallace later reduced them to 4' height, making a fairer empirical card. Dennett used similar letters, but enlarged the difficult and diminished the easy from the 5' size, thus giving letters of equal legibility but of wholly empirical basis.

Green in his edition of Carter (1878) gave us a new letter—a block roman capital of more conventional and reasonable form than Snellen's, in which the expanded feet and other adnexa of the letters were generally formed of half-minute blocks. Employing this type, Snellen's principle can be strictly applied and most of the alphabet can be inscribed in a 5' square with 1' lines and interspaces. The I and J are much too easy, the M and W rather too hard to discern, while others with circular or oblique lines are either easier or harder than the average, yet constitute valuable confusion tests.

Pleased with the more perfect exemplification of Snellen's principle afforded by these letters and recognizing more fully than any writer had set forth that the real principle was that *interspaces*, rather than lines should subtend an angle of 1', I constructed in 1880 series of test-cards with Green's letter, and published such a card in 1885 and again in 1895. With Drs. Risley and Posey as a committee I prepared for the Public Education Association of Philadelphia a simple school card in 1902, economizing space by using but a single letter for the larger types. For nearly twenty-five years it has been so clear to me that the 1' test is in letters the real test for visual acuity, that I have read such a view into the writings of Snellen and others, where it has been vaguely, if at all stated; and it is only latterly that I have felt the need of reiterating and enforcing this view by finding so many to be caricaturing or disregarding it. It may be known to all; but it certainly is not duly observed by many who have pub-



lished tests. Letters, or rather objects otherwise constructed, can have undoubted value; but they must rest on more or less empirical basis, and if they are not block-letters they have no right to claim to fulfil Snellen's principle.

Let us construct our test-objects so that they shall furnish at the desired distances rational images averaging nearly the minimum visible as calculated from the size of the cones of the retinal macula; and use the principle of contrast which seems to demand one unaffected cone between two stimulated cones to insure clear recognition of all details of fairly complex objects, and we will be nearer to a true standard for measuring vision. The illumination under which the tests are to be viewed must also be standardised as by the use of artificial light of fair constancy; since with narrow pupils under open sky one should see nearly twice as sharply as on the same card in the consultation room. The white letters upon a black ground as used by Seggel, Gould and others, have certain advantages; but the more usual black letter can be as well used if printed upon a surface distinctly creamy and free from such irradiation,

Snellen's first "Optotypi" were claimed to be based on the arc of 5' at the required distances; but in his later papers (Norris and Oliver, Vol. II., p. 18) he makes the usual error of using the tangent of the angle. Thus the LX meter letter has a height of 87.25 mm. instead of 85.5 as when calculated on twice the tangent of half the angle and should be visible at 61.22 m. While this error is small, it is needless, and typifies countless other wilful misrepresentations of the principle embodied in the various "Snellen's Types", which have been published.

REMARKS CONCERNING SOME PARTS OF THE  
TECHNIQUE OF MULES' OPERATION, THE  
HANDLING OF THIERSCH GRAFTS,  
AND ADVANCEMENT OF THE  
RECTI MUSCLES.\*

BY JOHN E. WEEKS, M.D.

NEW YORK.

1. In performing the operation commonly known as Mules' operation, in which a ball made of glass, gold, silver, or other substance, is placed within the sclera, it is the experience of nearly all operators that the union between the margins of the sclera has given away sooner or later and that the enclosed ball has escaped. In order to make the union between the scleral margins perfectly secure, the writer has employed a suture which passes through the sclera as indicated at *a* in the accompanying diagram (Fig. 1), and which,

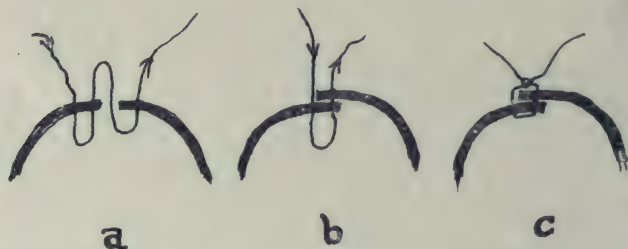


Fig. 1.

when tied, causes the margins of the sclera to overlap as at *b* and present the appearance as at *c*. Interrupted or continuous sutures may be employed. The writer uses chromatinized catgut No. 1, which dissolves in from twelve to sixteen days. The union obtained is much more firm than can be obtained by end-to-end suturing. The conjunctiva is united over the sclera with silk sutures in the usual way.

\*Read at the Meeting of Amer. Acad. of Ophth. and Oto-Laryng., Aug. 26, 1904.



2. The handling of Thiersch grafts in the ordinary way has undoubtedly given many operators not a little annoyance, because of the tendency to roll up and to become folded as soon as the flap is taken from the knife. The method employed by the writer has given him much satisfaction, as it enables him to handle the flaps and to adjust them to the surface to be covered with the greatest ease and certainty. The flap is cut from the selected surface with razor or special knife, flooding with normal salt solution in the ordinary manner. By the aid of the salt solution, the flap after it is detached is spread out as well as possible on the knife, the epithelial surface upward. A strip of sterile rubber tissue larger than the flap is now sparingly smeared on one side with sterile bichloride vaseline, 1-5000, and the smeared surface



Fig 2.

laid over the Thiersch flap and gently pressed upon it. The strip of rubber tissue, to which the flap adheres, is now lifted from the knife and the flap is spread out to its full extent. It is then cut while still on the rubber tissue to cover the area for which it is designed and applied to the raw surface, leaving the rubber tissue on the flap as a protective covering. The ordinary dressings are now applied. The rubber tissue may be removed after the lapse of four to six days.

3. In advancing a rectus muscle, the writer has found the following procedure to be satisfactory in technique and to give excellent results. Cocaine and adrenaline are employed whether a general anaesthetic is or is not used. With local anaesthesia the operation is devoid of pain of any moment. The instruments required are speculum, straight mouse-tooth forceps, medium size, fixation forceps, broad slotted forceps\* (Fig. 2), strabismus hook, scissors (Stevens' strabismus

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\*These are strong fixation forceps with rather fine teeth. Each blade measures 6 mm. in width and is slotted. The slot runs from the edge of the blade upward 4 mm. and is 1.5 mm. wide to accommodate the closed blades of the mouse-tooth forceps. They are made by George Tiemann & Co., New York City.

scissors are very excellent), double-armed sutures of No. 3 or No. 5 silk, needle-holder.

At the beginning, the location of the horizontal meridian is marked in the conjunctiva at the margin of the cornea, corresponding to the side of the muscle to be advanced, by catching up the conjunctiva with the mouse-tooth forceps and nicking it with the scissors. This mark is of value as a guide in passing the central suture through the scleral tissue. The conjunctiva and subconjunctival tissue over the insertion of the tendon of the muscle to be advanced are now raised by means of the mouse-tooth forceps and are incised, the incision corresponding to the line of insertion of the tendon and extending a little beyond the insertion at either border. The tendon, now exposed, is seized at its middle with the mouse-tooth forceps and is snipped through. The detachment of the tendon is extended both ways from its center, leaving a stump of perhaps one-half millimeter attached to the globe, until an opening sufficiently large (six millimeters in length) to admit a blade of the slotted forceps is obtained. The mouse-tooth forceps are made to engage the middle of the tendon at its cut edge, the conjunctiva, and subconjunctival tissue, and these are held until the slotted forceps can be placed in position. One of the blades of the slotted forceps is slipped beneath the end of the tendon and the other blade is shut down on the engaged portion of the tendon, conjunctiva, and subconjunctival tissue, including one and a half to two millimeters of these tissues, the mouse-tooth forceps by which these tissues are held being accommodated in the slot. The mouse-tooth forceps are now removed, leaving the end of the tendon, conjunctiva, and subconjunctival tissue firmly engaged between the blades of the slotted forceps and thoroughly under the control of the operator. The detachment of the tendon is now completed.

Three double-armed silk sutures (No. 3 or No. 5) are employed, one of which, the middle one, may be white for purposes of identification. The needles that are passed through the tendon pass first from the under surface, including muscle, subconjunctival tissue, and conjunctiva. It is well known that the sutures, unless looped or tied over a few fibers of the tendon of the muscle, will pull through or cut



through the tendon to a greater or less degree, according to the tension, lessening the effect. The end of the suture that passes through the scleral and episcleral tissue does not cut through so easily. To prevent this cutting through and to avoid injury to the tendon by strangulation or cutting through a portion of the fibers, as may occur when a portion of the tendon is tied in the suture, the writer loops or "quilts" the middle suture in its passage through the tendon in all cases (see Fig. 3). In cases in which the traction is to be excessive, all three of the sutures are looped. This is done by

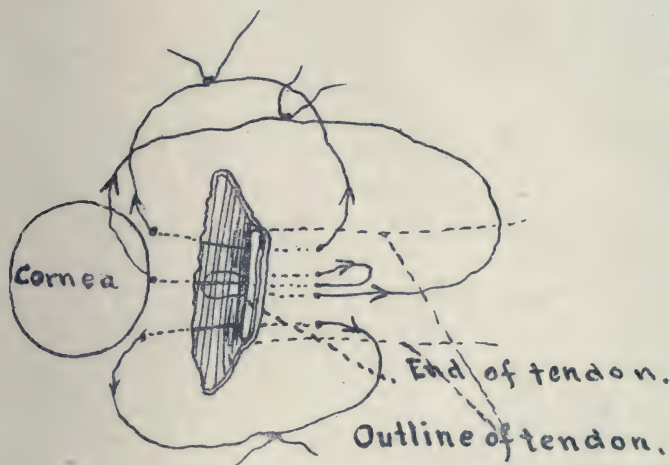


Fig. 3.

passing both of the needles of the middle suture through the tendon and superimposed tissues from the under surface, one millimeter on each side of the middle line of the tendon at the proper distance from the cut end of the tendon, and returning one of the needles through the middle line of the tendon from the conjunctival surface on the same plane with the first two. After the sutures are passed through the tendon, the desired shortening of the tendon is effected. The endeavor is made to include in the grasp of the slotted forceps only as much of the end of the tendon, conjunctiva, and subconjunctival tissue as it is desired to remove (one to two and a half millimeters). To effect the shortening, it is then necessary to cut away only what is grasped by the forceps. Care must be observed not

to cut the sutures when excising the end of the tendon, and the sutures must pierce the tendon sufficiently far back from the end of the tendon (four to six millimeters) to ensure a permanent hold. The sutures that engage the scleral tissue must now be passed. A short stump of the tendon, if left on the globe, will be found of much aid in affording counter-traction. The needle should pass beneath the conjunctiva, penetrate into the sclera, and include about one-half of the thickness of the sclera. The needle of the middle suture should emerge at the margin of the cornea exactly in the horizontal meridian of the cornea, and the lateral sutures should emerge tangent to this margin of the cornea five millimeters above and below the middle suture. The sutures are then firmly tied, drawing the end of the muscle toward the cornea as far as possible without cutting through tissue. The opposing muscle is or is not weakened, according to the judgment of the operator.

The sutures are removed after the expiration of eight or ten days. The writer sometimes bandages but one eye, but often bandages both eyes for from one to three days in order to prevent undue strain on the sutures by frequent movements of the eyes.

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## AN EXPERIENCE WITH STAINING THE SKIN BY ARGYROL.

By H. M. Post, M. D.

ST. LOUIS, MO.

April 6, '04, my assistant operated on a chalazion of the left upper eyelid, of one of my regular patients. After he had scraped out the cavity, being an enthusiast about argyrol, he injected argyrol 25 per cent. into the cavity.

The following day the patient returned with the upper lid very black and shining, not like an ordinary "black eye"; but like a highly polished stovewood. The eyelid was swollen, and the discoloration extended almost to the eyebrow. The



condition looked very serious, and I was not at all certain that it might not be permanent.

Knowing that iodide of potassium will remove nitrate of silver stains, I reopened the incision, and injected into it a solution of iodide of potassium gr i to ʒi.

April 8th, much to my satisfaction, the staining was less at the site of the chalazion, but a little way from it the discoloration was no better. The swelling of the lid was greater. I injected the cavity of the chalazion again with iodide of potassium solution, and in order to attack it *vi a tergo*, as well as *vi a fronte*, I prescribed internally iodide of sodium gr. v three times a day.

April 9th, staining still less at site of operation, swelling less. Increased iodide of sodium to gr. vii ss, and injected iodide of potassium again into chalazion sac. (Condition of physician much more hopeful.)

April 10th, treatment the same.

April 11th, appearance of the eyelid much better, stain has almost disappeared from it, and is now confined almost entirely to the skin between the upper portion of the lid and the eyebrow.

Increased the dose of the iodide of sodium to gr. x three times a day.

April 13th, one week after the injection of argyrol was given, the stain was almost gone. Eyelid was still very much swollen. Reopened incision and injected sulphate of zinc gr. i to ʒi. Continued the sodium iodide internally.

April 15th. Stain gone, swelling less. Stopped the iodide of sodium.

From this time the case made an uneventful recovery.

One of my colleagues informs me that he has had a discoloration from argyrol which has disappeared under no treatment. I have a case now coming to me where a discoloration was produced by frequent injections of the lacrimal sac with argyrol, given a number of months before the occurrence of the case reported above, and the discoloration remains unchanged. It is slight and I have not used the iodide of potassium injection.

The mixture of a solution of the iodide of potassium with a solution of argyrol, gradually produces a white precipitate,

and I can not but think that the injections had something to do with restoring the eyelid to its normal color, especially as the clearing of the discoloration began at the point where the solution of the iodide was injected, and where the discoloration was greatest.

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## NEW CLAMPS FOR FIXING THE EYELID IN SUBSECTION OF THE TARSUS.

By ARTHUR E. EWING, M.D.,

ST. LOUIS, MO., U. S. A.

While the modification of the *pince anneau* of Desmarres, which was described in an article on entropium of the lower



Fig. 1.

lid in the February number of this journal, 1903, serves its purpose very well as an aid for making the tarsal incision (the



subsection of Green) in this operation upon the lower lid, the broad spatular blade interferes with the placing of the stitches, and its value as a hemostatic is lost. It also does not work well in the same operation in the case of the upper lid.

To remedy these defects I have devised another instrument (manufactured for me by the Blees-Moore Instrument Co., in January, 1904), which is a clamp (figure 1) with blades two millimeters wide by one millimeter in thickness and as long as the eyelid, placed at right angles to the handle, and having a curve about the same as that of the free margin of the lower lid, with a short curve in the opposite direction at the distal end. This clamp works admirably both for the upper and the lower lid, but at the distal end it is weak. The handle is also heavier than is necessary for an object so delicate as an eyelid.

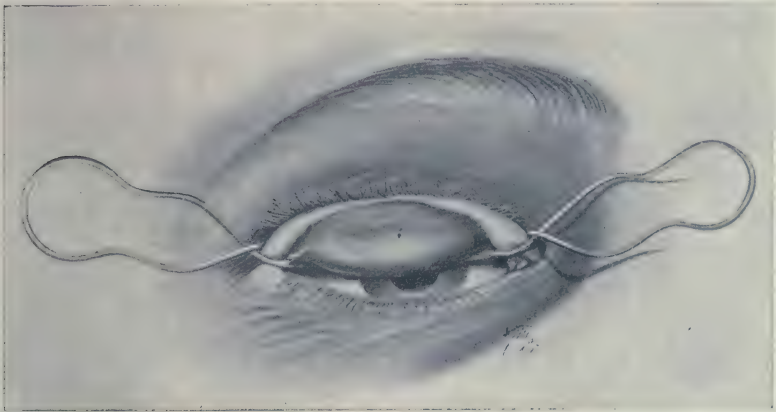


Fig. 2.

Recently I have constructed another instrument, which clamps evenly the whole length of the lid, and which is also very light. It is made of "piano," or steel spring wire one millimeter in diameter. The blades are similar in their form to those in the above-mentioned clamp, except that the one for the conjunctival surface is a continuation of the wire, while that for the dermal surface is of the thickness of the wire, but re-enforced so as to make it two and one-half or three millimeters in width. At either end of the blades the wire is crossed and continued in loops in such a way as to

form springs, and the springs are bent forward in order that the clamp may fit into the inner angle. On pressing the springs the blades are opened. By everting the upper lid this clamp is easily applied so as to include the whole or any part of the lid (Figure 2). The lightness of the instrument together with having its springs entirely out of the way of the operator make it ideal for its purpose when used on the upper lid, for which it was primarily designed. It does not work so well on the lower lid, the width of the loop interfering with the eversion.

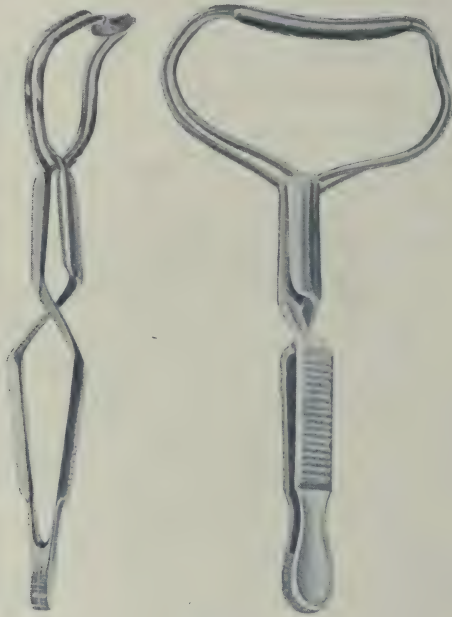


Fig. 3.

In order that similar forms for the blades might be used with the lower lid, the wires at either end of the biting portion of the blades were continued in an elliptical form, the one parallel with the other, and attached to the arms of a very light self-clamping forceps (a screw adjustment may be used if preferred) (Figure 3). To prevent the handle cumbering the operator the blades are bent about their long axes to an angle of one hundred and twenty degrees. With this instrument either the upper or the lower lid may be everted to any position desired, the lower lid by placing the broader blade



against the dermal surface of the lid just below the cilia, and making gentle pressure downward and backward until the necessary eversion is obtained, and then applying the thinner blade to the conjunctival surface. For its use on the upper lid, the lid should be everted as in the case of the wire spring mentioned above. By a little manipulation the broader blade may then be applied to the dermal surface, and the thinner to the conjunctival surface in such a way as to pass back of the tarsus, and fit snugly into the outer and inner angles so as to expose the whole tarsal portion of the lid. The wider blade upon the dermal surface gives sufficient resistance to aid in the incision through the tarsus from the punctum to the outer angle, and yet it is not so wide as to interfere with the placing of the sutures. The handle of the forceps rests upon the forehead: with the lower lid it rests upon the cheek.

In my experience with several cases since writing the article published in 1903, I have found it best to use a greater number of sutures through the lid than was recommended in that article, three to six in the lower lid, and five to eight in the upper lid, in order to securely fasten the conjunctival margin of the standing portion of the tarsus into the bottom of the wound. Also, better union will be obtained by not disturbing the lid very much for four or five days: proper cleansing may be effected by moderately raising the lid without completely everting it. Under favorable aseptic conditions the sutures may remain from five to seven days. To facilitate their removal, as well as to prevent them cutting through the skin, a large sterilized thread may be passed beneath them on the dermal surface before tying them, and allowed to remain until they are to be removed, when by lifting one end of this thread they may readily be divided one after the other. Collodion is not essential to the eversion, but I prefer it as a protective dressing, and usually apply it after twenty-four hours, when the circulation in the lid has become fully established.

For my drawings I am indebted to Dr. R. Walter Mills. For aid in perfecting the finish of the last two clamps I am under obligation to Mr. C. W. Alban, surgical instrument maker.

# MEDICAL SOCIETIES.

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## OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

JOHN TWEEDY, F.R.C.S., President, in the Chair.

*Thursday, January 26th, 1905.*

### MALIGNANT DISEASE OF CONJUNCTIVA.

Dr. Freeland Fergus, in a paper read in the absence of the author by Dr. F. R. Hill (Carlisle), related a case of malignant disease of the conjunctiva. The patient was a girl, aged 9, who was sent to him by Dr. Hill in November, 1903. On the lower part of the bulbar conjunctiva were some sprouting vegetations, with an appearance not unlike that seen in spring catarrh. The limbus and palpebral conjunctiva were unaffected. It had first been noted six months previously. The vision was 6/9, and a portion was removed for examination. The pathological report was indefinite. Shortly after the rest was removed, and the patient was sent back to Carlisle under Dr. Hill's care. The pathological reports of Professor Muir and Mr. Devereux Marshall showed the growth to be of an unusual character, but probably a sarcoma, but its appearance left no doubt as to its being malignant. On March 21st, owing to its rapid extension, the whole contents of the orbit were removed, and the patient was sent back on April 14th. On May 23d she was again seen, but the recurrence was so extensive that no operation was possible. The neighboring glands were also involved, and even at this time there were cerebral symptoms. The child died in October with the tumor of enormous size. The *post-mortem* examination showed extensive involvement of the brain. The growth was apparently a leucosarcoma.



Mr. Parsons, who had examined the growth, said it appeared to him to be one of those rare cases when some naevoid tissue takes on malignant growth, and he looked upon it as being probably an epithelial growth rather than a connective-tissue one.

#### QUININE IN THE TREATMENT OF CORNEAL ULCERS.

Mr. Arnold Lawson read a paper on the treatment of corneal ulcers by quinine. He said that up to the present time the use of quinine in ophthalmology had been restricted to a very limited class of conjunctival and corneal affections, but his observations, which had extended over four years, showed that it was a very powerful curative agent in a large variety of corneal ulcers not amenable to ordinary routine treatment, to which much more drastic measures were commonly applied. The sulphate of quinine dissolved carefully in just sufficient sulphuric acid to hold the salt in solution was preferable to either the hydrochloride or the acid sulphate, both of which were soluble in water; and it was recommended to be used in a 1 per cent. solution. The eyes should be soaked in the solution for five minutes four or five times a day, and in addition a thorough irrigation daily by an undine filled with the solution was advised. It caused very little discomfort, and patients used it readily, but stronger solutions gave rise to pain, and had no advantage. When the treatment was going to be successful, improvement showed itself within a few days, and if no manifest benefit was obtained within a week it might be discontinued. The rapidity of healing under this treatment was at times remarkable, and the author had seen many formidable-looking ulcers heal by this treatment alone within a week. A list of several cases of corneal ulceration treated by this method within the last three years was appended to the paper.

#### THE NOTATION OF PRISMS.

Mr. Claude Worth read a paper on the notation of prisms. He said that when one ordered a spherical or cylindrical lens, one did not concern oneself with the refractive index of the glass of which it was made. One specified that it should

have a certain definite effect upon a pencil of light, and bring it to a focus at a certain specified distance. But prisms were numbered by most opticians according to the geometrical angle, so that if one wanted a prism which should deflect a pencil of light say 4 degrees, one had to order a prism of 8 degrees geometrical angle. The optician then supplied a prism whose actual deflecting power was somewhere between 3 degrees and 5 degrees, according to the kind of glass of which it was made. It was much more convenient and accurate to number a prism according to the number of degrees which it deflected a pencil of light. Although this matter had been described before, yet he brought it forward in the hope that the Society would make some definite pronouncement which would be accepted by spectacle makers in this country; much inconvenience would thus be avoided.

#### DETACHMENT OF RETINA.

Dr. D. J. Wood (Capetown), after referring to a case of detachment of the retina recorded by him in vol. xii of the *Transactions*, described another case which he had recently seen which bore a strong likeness to the previous one. The patient was a bucolic Dutchman, aged 35, whose right eye had been lost five years before from perforating ulcer, and the eye had been removed. Since that time, the sight of the left had been failing, but had rapidly deteriorated during the last five weeks. His vision was P. L., and he could just see large objects moving below. The pupil was active, and the tension was normal. The ophthalmoscope showed two rounded detachments meeting and widening out above. The vitreous was clear, and one could just see below the disc, but the striking feature was the swelling and tortuosity of the vessels, which at once recalled the former case to mind. The vessels were more than double their natural size, and were tortuous to a degree. Both arteries were constricted at frequent intervals, so that the arteries looked like beads, while the veins had the appearance of strings of sausages. The constricting bands were retinal in origin, and looked as if they were stitches holding the vessels down. In both cases it was difficult to follow the vessels, not only on account of the tor-



tuosity, but also because the color of the arteries and veins was so similar. There were no recent hæmorrhages, but some patches that were seen probably represented old ones. The question was whether it was a proliferation of inflammatory material in the retina or a primary disease of the vessels. Probably serous exudation caused detachment of the retina, but it was difficult to account for the lightness of color of the veins which was seen in both cases.

Mr. Louis Werner showed a sketch of a case of neuro-retinitis of a severe type which occurred in one eye of an anæmic girl, aged 24. There was neither headache nor vomiting, the only symptom being a feeling of lassitude and, for a time, excessive thirst. There was no albumen present, but the sugar reaction was doubtful. The left eye failed suddenly one morning, and the vision was reduced to hand movement. The field of vision was greatly contracted, but the color perception was good. The upper part of the disc was greatly swollen, with large corkscrew-like vessels spreading out from it, while the lower part was white and atrophic but indistinct. In less than three days a perfect star of white lines appeared at the macula. Under iron the swelling disappeared in three months and the vision improved to 6/36. The author referred to a case reported by Gowers, in which retinal changes resembling those of albuminuric retinitis occurred in a chlorotic patient.

#### EXHIBITS.

Dr. L. Cole-Baker showed a needle holder for use with either straight or curved needles, and a modification of Clark's eye speculum.—Mr. Bishop Harman showed a case in which there was congenital absence of the internal and external rectus muscles.—Mr. Secker Walker showed a radiograph of a case of gunshot wound in which two shots had entered the eye at the same hole and had lodged at the back of the orbit.—Mr. Paton showed a case of neuro-retinitis.

## THE DOMINANT OR PREVAILING EYE.

TO THE EDITOR OF AMERICAN JOURNAL OF OPHTHALMOLOGY:—

In the *Trans. Amer. Oph. Soc.* for 1904 just issued, there appears a paper by Dr. Geo. M. Gould, on "the pathologic results of dextro-ocularity and sinistro-ocularity," with an interesting discussion thereon.

Among other points raised was the question as to who first noted the existence of the "dominant eye," Dr. Gould claiming that it was original with him so far as his research into the literature enabled him to judge, and he requested that any earlier reference to the matter be made known.

I remembered that during my student days I had, while making some physiological investigations on a cognate subject, read a paper somewhere bearing directly on the very point under discussion, and finally it came to my mind that it was in an early number of *Knapp's Archives*. Turning back to the early volumes I found in the very first number, 1869, p. 186, an article on "The Theory of Binocular Vision," by H. Kaiser. The second division of his paper is on "The Prevailing Eye," in which he shows, exactly as Dr. Gould has done, by experimentation, that the right eye is the "prevailing eye" used in "sighting" by a right handed person, and the left is the prevailing eye in the left handed, though this latter is "not to be admitted without circumspection." This resurrection, while not in the least reflecting upon the independent originality of Dr. Gould, shows that it is yet true that *vixere fortes ante Agamemnona*.

SWAN M. BURNETT.

Washington, D. C., Jan. 19, 1905.







Foreign Body in the vitreous, which has become loosened from its position on the retina and is suspended by a connective tissue band in the vitreous.

Fig. 16.



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ORIGINAL ARTICLES.

METALLIC FOREIGN BODIES WITHIN THE EYE AND  
THEIR REMOVAL, BEING A CLINICAL ACCOUNT  
OF TWENTY-SIX OPERATIONS OF THIS  
CHARACTER.\*

ILLUSTRATED.

By G. E. DE SCHWEINITZ, A.M., M.D.,

PHILADELPHIA, PA.

IN recent years, especially since the utilization of the X-rays for the localization of foreign bodies within the eyeball, and the employment of large magnets, notably the Haab magnet, for their removal, this subject has assumed ever increasing interest. All surgeons are agreed as to the propriety of speedy removal of these bodies by means of magnets. There is still some difference of opinion whether it is better to draw the imbedded particle of metal from its position around the lens into the anterior chamber by means of a powerful magnet, especially the Haab magnet, and then extract it through a corneal incision, or whether, having ac-

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\*Presented at the Denver Meeting of Amer. Acad. of Ophth. and Oto-Laryng., Aug. 26, 1904.

curately localized it by means of the x-rays, it should be extracted through a scleral incision so placed that it shall be directly above the position indicated by the localization. In order to introduce a few remarks upon the subject, I append the condensed clinical histories of twenty-six cases in which the magnet has been employed, both with and without accurate localization for the removal of foreign bodies. They are as follows:

CASE 1.—James D., white, American, aged 28, was admitted to the Methodist Hospital on April 16, 1895, about one hour after he had received an injury of the left eyeball by a piece of steel which had broken from a chisel.

*Condition of the Eye.*—There was a cut 2 cm. in length along the line of the external rectus muscle; much vitreous had escaped and the eyeball was soft. The pupil was widely dilated, and only a dim view of the fundus was visible, the vitreous being obscured with blood-clot. V = counting fingers; visual field intact.

*Method of Localization.*—It was not possible to ascertain positively the presence of a foreign body by any of the usual methods then in vogue.

*Operation.*—The extension point of a Hirschberg magnet was introduced through the original wound and moved in all directions, without at first detecting a foreign body, and the eye dressed in the usual manner. Later, a small fragment of steel was detected just beyond the wound margin, where it had probably been drawn by the magnet and been rubbed off, when the instrument was withdrawn.

*Result.*—Healing was uneventful, and in two weeks the vision of the injured eye was 6/9. One month later hyalitis developed, and two weeks later detachment of the retina. The patient has not been seen since the last named date; but a second small fragment of steel was removed by another surgeon which was imbedded in the sclera. This case has been reported in the AMERICAN JOURNAL OF OPHTHALMOLOGY, Vol. XIII, 1896, p. 47. The small fragments of steel found near the wound are not, however, recorded in this account.

CASE 2.—F. McD., aged 19 years, single, machinist, consulted me on January 13, 1897, on account of an injury to



his left eye. Twenty-seven hours before his visit, while working around an engine and sledging upon some portion of the machinery, he was struck in the left eye with a chip of steel which flew from the piece of metal on which he was striking, the blow having been delivered in an upward direction. The foreign body entered through the sclera at the lower and inner quadrant of the eye. The patient was immediately taken to a neighboring hospital, where an electromagnet was twice introduced through the wound of entrance, without, however, removing the foreign body. The physician in charge of the operation stated that he thought he had moved the body, but that his magnet was not strong enough to withdraw it. The patient, by the advice of Dr. John Fay, then came to Philadelphia, with the hope of obtaining relief.

*Condition of the Eye.*—V. of L. E. = 5/60, with difficulty. The pupil was dilated widely, probably from the effects of atropin, the tension was diminished, the bulbar and tarsal conjunctivæ were flushed, and a small bead of vitreous protruded from a linear wound 3 mm. in length, situated  $1\frac{1}{2}$  centimeter from the corneal border, downward and inward, between the insertion of the internal and inferior rectus.

Ophthalmoscopic examination was unsatisfactory, on account of the haze in the vitreous, which prevented accurate observation of the details of the fundus. As far as could be made out, however, these included a vertically oval disc, enormously distended and tortuous veins, a patch of white tissue upon the nasal side of the disc, a fringe of hæmorrhage downward and outward from the papilla, and far forward in the upper portion of the eyeground an indistinct spot of dark color, vaguely resembling blood-clot, but very difficult to study. The lower half of the vitreous was filled with large blood-clots, through which could be seen dimly the rent in the coats of the eye.

*Method of Localization.*—Prior to the magnet operation, before the patient came under my care and prior to my own first operation, no method of localization other than that afforded by ophthalmoscopic examination was attempted. Before the third magnet operation was performed the foreign body was detected by the Roentgen rays and its position ap-

proximately determined. The X-ray examinations were made by Dr. Max J. Stern, of the Philadelphia Polyclinic, and indicated that the body was in the upper ciliary region.

*Operations.*—In the first magnet operation, the point of the instrument was introduced through the wound of entrance, and the result was negative. In the second operation the magnet was introduced through a wound in the upper ciliary region and was also unsuccessful. In the third operation the magnet was introduced through an incision, 8 mm. in length, in the upper ciliary region, midway between the insertion of the superior rectus and the corneal margin. The magnet used was according to the Hirschberg model, and the foreign body was immediately withdrawn. It weighed .0266 grams, or .41 grains, and was 4 mm. in length and 2 mm. in width.

*Result.*—The iridocyclitis, which was well established, rapidly subsided, and twelve days after the operation, the patient returned home with a vision of 6/12. There were some hyalitis and slight discoloration of the iris. Two months later vision was still 6/12, but the beginnings of proliferatingiritinitis and the formation of connective tissue bands were visible.

*Remarks.*—It seems to me a very interesting circumstance that an eye can sustain such great traumatisms and still heal with useful vision. These traumatisms consisted of those produced originally by the entrance of the foreign body and its lodgment in the ciliary body; those caused by the immediate introduction, twice, of an electro-magnet; those caused at my first-electro-magnet operation, when the points were introduced both through the wound of entrance and through a new opening; and, finally, those produced by the successful electro-magnet extraction through a cut in the same position. Furthermore, the foreign body was imbedded in the ciliary body for twelve days, and had already caused enough irritation to start a cyclitis. This case has been fully reported in the American Journal of the Medical Sciences, May, 1897.

CASE 3.—A. G., white, male, American, aged 18, while striking with a hammer on a steel drill, received an injury of the left eye, a piece of the metal penetrating the globe. He



was referred to me by his physician, Dr. Alexander R. Craig, of Columbia, Pa.

*Condition of the Eye.*—The eye was examined within ten hours after the accident, and presented the following conditions: There was a small cut in the center of the cornea, about 4 mm. in length, from which was protruding a thin string of vitreous. A similar cut could be observed in the capsule of the lens, and the lens itself was entirely opaque. The iris was discolored. Vision equalled shadows.

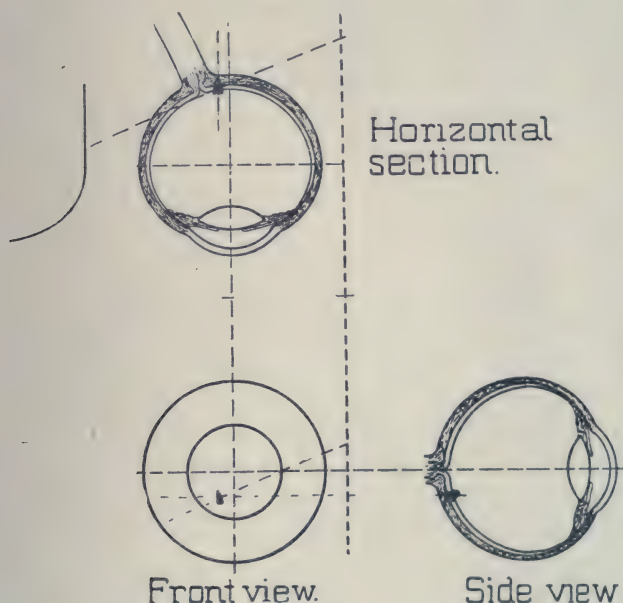


Fig. I.

*Method of Localization.*—The patient was referred to Dr. Sweet for X-ray examination, who reported as follows: The piece of metal, which is small and about 3 mm. long and 1 mm. wide, is situated 1 mm. above the horizontal plane of the globe, 1.5 mm. to the nasal side and 23 mm. back of the center of the cornea. This would bring it in the retina in the neighborhood of the macula. Fig. I.

*Operation.*—A scleral incision was made a little below the

lower margin of the external rectus downward and outward about a centimeter in length, and through this opening the broad, flat extension point of a Hirschberg magnet was introduced for 15 mm. The current was turned on, and on withdrawing the instrument, a triangular piece of steel was found attached to it, 2 mm. at its base, 1 1/2 mm. at its apex and 3 mm. in length. It weighed .0078 grams, or .12 grains.

*Result.*—The patient remained in the hospital one week, and was returned to his physician with the eye still slightly flushed, but in other respects in good condition. After his return home, he had an attack of pain with increased intra-ocular tension, which subsided under proper treatment and was evidently due to swelling of the crystalline lens. He was seen three months after the operation, his eye perfectly white and quiet, good light perception in all portions of the field and the ordinary appearance of traumatic cataract. The extraction of this would probably have restored vision, but the operation was declined.

CASE 4.—J. B., male, white, American, aged 40, while striking with a hammer on a spike received an injury of the left eye, and reported for treatment in the Jefferson College Hospital twenty-four hours later, having traveled a long distance on the railroad with a very imperfectly applied dressing.

*Condition of the Eye.*—There was a large cut in the sclera on the outer side, from which prolapsed vitreous and choroidal pigment were protruding. The eyeball was collapsed, the anterior chamber and, as far as could be ascertained, the vitreous filled with blood. Vision was doubtful light perception.

*Method of Localization.*—The patient was referred to Dr. Sweet for skiagraphic examination, who reported as follows:

Examination January 5, 1901. The body is located at the equator and to the nasal side, that is, 12 mm. back of the center of the cornea and 12 mm. to the nasal side of the vertical plane. Fig. II.

*Operation.*—The broad extension point of a Hirschberg magnet was introduced through the original wound and immediately attracted to itself the piece of metal, which weighed .2284 grams, or 3.525 grains. The collapsed eyeball was

filled with physiological salt solution and the wound closed with interrupted sutures. The patient was placed in bed and the usual treatment of continued iced compresses, together with the internal administration of calomel, was instituted. There was no special reaction, and for a few days it appeared as if the wound might heal kindly. Indeed, it did close, but little by little the contracting exudates caused the eye to assume a quadrate form, and it never lost its tenderness and

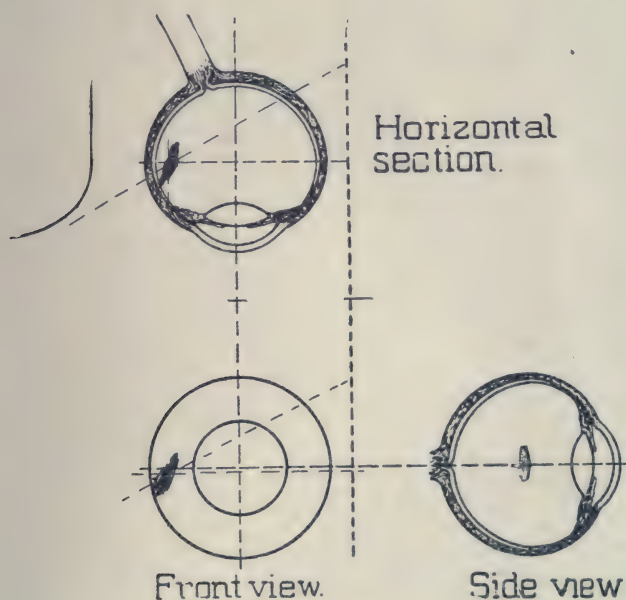


Fig. 2.

ciliary flush. Fearing that it might produce sympathetic trouble in the opposite eye, the shrinking globe was enucleated two months later.

*Pathological Examination of the Enucleated Eye.*—The eyeball was hardened in formalin and divided in the usual manner, half being mounted in glycerine-jelly and the other half submitted to microscopic examination. Fig. III. The eyeball is shrunk; the cornea shows new vessel formation and infiltration of the limbus. The iris presents evidence of



old iritis with destruction of the stroma cells, clumping of the pigment and fresh infiltration with mononuclear round cells, which are collected in round masses at the periphery and along the vessels. The vessels of the iris and ciliary body are hyperaemic and there is considerable extravasation of blood in the tissues, particularly in the meshes of the ciliary body and around Schlemm's canal. The lens shows advanced cataractous changes, especially in the posterior part, where the capsule is eroded. Behind there is a thick cyclitic mem-

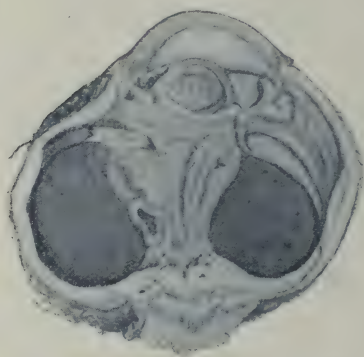


Fig. 3.

Gross appearance of the diseased eyeball, Case IV.

brane which extends across the eyeball, which is well organized and has produced detachment of the ciliary body and anterior part of the choroid. It contains considerable pigment from old intraocular haemorrhage. In it is imbedded the retina, which is totally detached, passing forward from the optic nerve. The retina is in an advanced stage of degeneration and contains between its folds old blood pigment. The choroid is hyperaemic, thickened in places by organized exudate, and shows moderate fresh cellular infiltration. Anteriorly it is detached by the cyclitic membrane. The ciliary body is atrophic and the meshes widely pulled apart by blood extravasations. The optic nerve is also atrophic.

CASE 5.—J. C., male, white, American, aged 48, reported

at the Jefferson Medical College Hospital, with a chronic iridocyclitis and small corneal ulcer of the right eye. This eye had been injured eighteen years ago, but until a few weeks previously it had been quiescent.

*Condition of the Eye.*—There was well-marked chronic cyclitis, with occlusion of the pupil and cataract. In the lower part of the cornea there was a small ulcer. Vision was *nil*. The vision of the left eye was 20/XXX, and there was distinct sympathetic irritation.

*Method of Localization.*—Although there was no certainty that the eye contained a foreign body, the patient was referred to Dr. Sweet for skiagraphic examination, who reported as follow:

Examination January 28, 1900. Eye contains foreign body  $1.5 \times 1$  mm. which is situated 8 mm. back of the center of the cornea, 10 mm. below the horizontal plane, and 1 mm. to the temple side.

*Operation.*—The extension point of a Hirschberg magnet was introduced through a scleral incision over the region in which the skiagram indicated that the body was situated, and it was immediately drawn to the lips of the wound. The condition of the eye was such, however, as well as that of the opposite eye, that an immediate enucleation was considered advisable, and it was performed. The signs of sympathetic irritation in the opposite eye subsided almost at once. The foreign body was 1.5 mm. long and 1 mm. thick.

*Remarks.*—This case furnishes a good example of the accuracy of Knapp's statement that foreign bodies may be tolerated for long periods of time in the eye, but can never be trusted, unless they are small and the accompanying changes trifling; otherwise they are liable to cause degenerative changes, and even after years cyclitis may arise and cause sympathetic disturbance in the fellow eye.

CASE 6.—H. D., male, white, American, aged 25, while striking with a chisel on some metal was struck in the left eye with a fragment, which penetrated through a wound in the inner corneoscleral area. He was immediately seen by Dr. Alexander Craig, who abscised the prolapsed iris, dressed the eye and sent him to me for further examination twenty-four hours later.

*Condition of the Eye.*—There was a ragged cut in the corneo-scleral region, at the inner side, the lens was cataractous and the anterior chamber half full of blood. Vision was reduced to hand movements above and to the outer side.

*Method of Localization.*—The patient was referred to Dr. Sweet for skiagraphic examination, who reported as follows:

Examination March 29, 1900. Foreign body is situated 12 mm. back of the center of the cornea, 10 mm. below the horizontal plane, and 3 mm. to the nasal side of the vertical plane. Fig. IV.

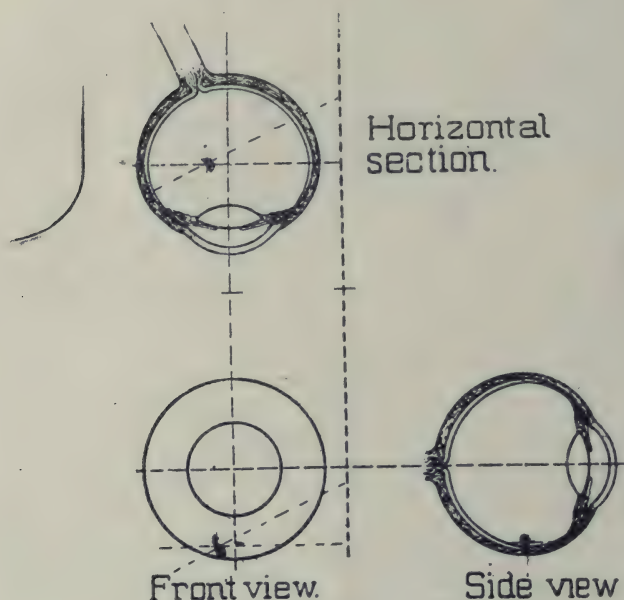


Fig. IV.

*Operation.*—The extension point of a Hirschberg magnet was introduced through a scleral incision placed according to the localization and the foreign body immediately withdrawn. The wound was closed with two stitches passing through the conjunctiva and sclera, and the usual treatment instituted. The healing was uninterruptedly normal, and the patient re-



turned to his home on the eighth day after operation. The foreign body weighed .127 grams, or 1.96 grains.

*Remarks.*—This patient was examined three years later. The eye had been perfectly quiet, and exhibited the appearance of a traumatic cataract and inward iridectomy. Vision equalled hand movements on the temporal side. Although a red reflex was visible through the partly absorbed lens, no details of the fundus were evident.

CASE 7.—H. K., male, white, American, aged 33, while striking with a hammer on some metal, received an injury of

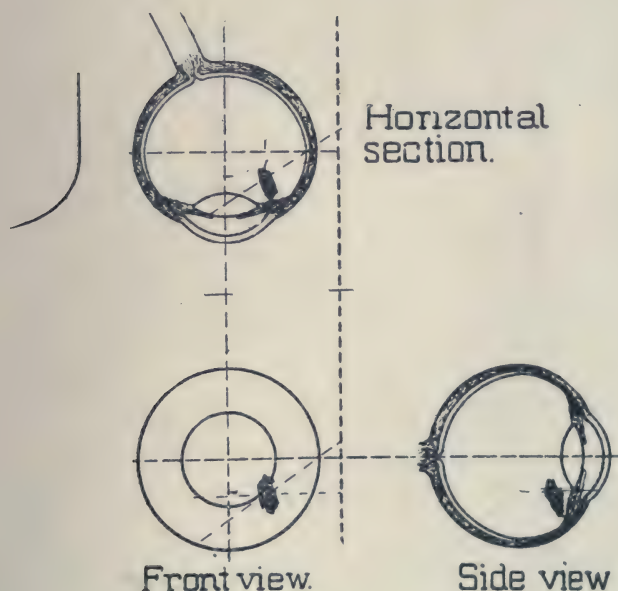


Fig. V.

the left eye, causing a wound of large size near the corneo-scleral junction. He reported twenty-four hours later at the Jefferson College hospital.

*Condition of the Eye.*—The iris was discolored, the eyeball collapsed, and the vitreous and anterior chamber filled with blood; T. — 2, V. doubtful light peception.

*Method of Localization.*—The patient was referred to

Dr. Sweet for skiagraphic examination, who reported as follows:

Examination October 21, 1900. The foreign body is situated 9 mm. back of the center of the cornea, 4 mm. below the horizontal plane, and 5 mm. to the temporal side of the vertical plane. (Fig. V.)

*Operation.*—The extension point of a Hirschberg magnet was introduced through the original wound and immediately a piece of steel withdrawn. The collapsed eyeball was filled with normal salt solution. The eye healed, but when the patient left the hospital, eight days later, it was still somewhat irritable, without view of the fundus. Two months later the evidence of contraction due to proliferating retinitis were present, the eye was painful, and it was enucleated. The piece of steel weighed 27 cts.

CASE 8.—J. W., male, white, American, aged 50, while striking with a sledgehammer on a piece of metal, was injured in the right eye. A few hours later an effort was made by the local surgeon to remove a foreign body, but this operation proved unsuccessful and he was referred to me for examination. He reported three days after the injury.

*Condition of the Eye.*—There was a complete ring abscess of the cornea, iritis and hypopyon, and deep in the angle of the anterior chamber, upward and outward, a small piece of metal could be seen.

*Method of Localization.*—As the foreign body was evident to inspection, no other method of localization was employed.

*Operation.*—The angle of the anterior chamber was opened with a keratome, a small piece of the iris excised, and the foreign body, deeply imbedded in the angle and ciliary region, removed. The anterior chamber was washed out with normal salt solution, and the usual treatment instituted. Unfortunately, the metal was lost and its weight cannot be given. Five days later the patient returned to the local surgeon, with the eye still much inflamed and the abscess of the cornea not yet resolved. Four months later he returned, and as the eye had shrunk and was useless, it was enucleated.

CASE 9.—T. McE., male, white, Irish, aged 33, while hammering upon some metal, was injured in the right eye, and reported for treatment about twenty-four hours later at the Jefferson College Hospital.

*Condition of the Eye.*—There was a large ragged wound through the cornea, the eye was filled with blood and vision reduced to light perception.

*Method of Localization.*—The patient was referred to Dr. Sweet for skiagraphic examination, who reported as follows:

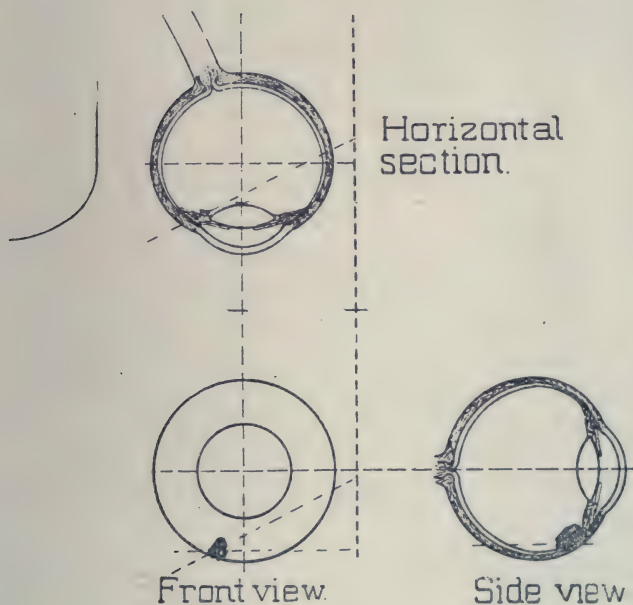


Fig. VI.

Examination April 5, 1901. The foreign body is situated 7 mm. back of the center of the cornea, 10 mm. below the horizontal plane, and 4 mm. to the nasal side of the vertical plane. (Fig. VI.)

*Operation.*—The extension point of a Hirschberg magnet was introduced through the original wound, and the foreign body immediately withdrawn. The usual treatment was in-



stituted, but in spite of it recurring intraocular haemorrhages with great pain continued. The patient became dissatisfied and left the hospital without permission and had his eye enucleated at another hospital. The weight of the foreign body was .1616 grams, or 2.495 grains.

*Remarks.*—It is very evident that this large foreign body had seriously injured some of the vessels of the choroid, perhaps the retina, and that the continued intraocular haemor-

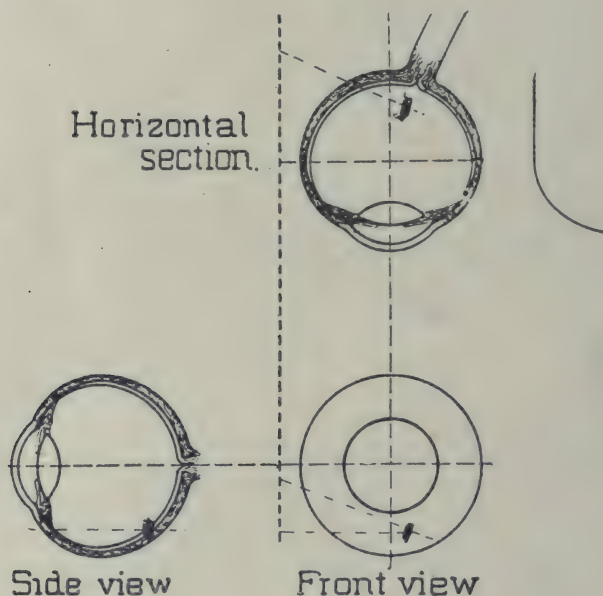


Fig. VII.

rhages were a consequence of this injury. Whether the eye would have quieted had the patient remained at the hospital is a matter of conjecture, but probably the original wound was sufficiently great, added to the intraocular haemorrhages, to have rendered, even had the patient remained under treatment, ultimate recovery hopeless.

CASE 10.—J. H., male, white, Irish, aged 38, while driving a steel pin, inserted in a clay mould, was struck in the right eye with a foreign substance. At the time of the ex-

amination it was uncertain whether this substance was steel or clay. He reported within twenty-four hours of the accident, and was admitted to the Jefferson College Hospital.

*Condition of the Eye.*—There was general bulbar injection and ciliary tenderness, together with a few spots of blood upon the iris. The lens was cataractous and swollen, and on its inner side there was a white spot more opaque than the rest, but close inspection failed to reveal any definite wound of entrance.

*Method of Localization.*—The patient was referred to Dr. Sweet for skiagraphic examination, who reported as follows:

Examination May 16, 1901. The foreign body is situated 19 mm. back of the center of the cornea, 9 mm. below the horizontal plane, and 2 mm. to the nasal side of the vertical plane. (Fig. VII.)

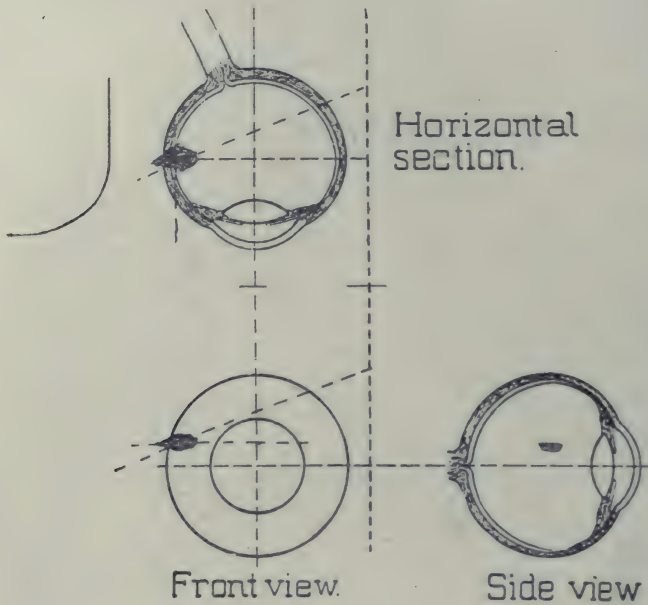
*Operation.*—The point of a Hirschberg magnet was introduced through a small scleral incision made in the region indicated by the localization as the position at which the foreign would be found, and this was immediately withdrawn and found to be a piece of steel weighing .0117 grams, or .18 grains. The patient was put to bed with the usual treatment and eight days later the swollen lens evacuated by linear extraction. Healing was uninterrupted, and six weeks later, with suitable glasses, V. = 6/5, the eyeground being normal.

CASE 11.—J. H., male, white, American, aged 35, while driving a spike, was injured in the left eye, producing a cut in the cornea-scleral region on the inner side, through which the iris was prolapsed. He was seen by a local surgeon, who excised the iris, but who seems not to have suspected the retained foreign body. One week later the patient reported at the Jefferson College Hospital.

*Condition of the Eye.*—There was well-marked iridocyclitis with discoloration of the iris, and the lens was cataractous. The inner half of the iris had been removed, as before stated.

*Method of Localization.*—The patient was referred to Dr. Sweet for skiagraphic examination, who reported as follows:

Examination March 7, 1902. The size of the body is  $6 \times 4$  mm. It is situated 3 mm. above the horizontal plane at



VIII.

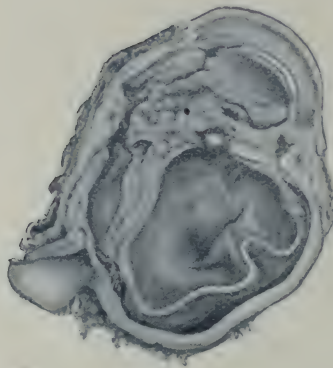


Fig. IX.

Gross appearance of the divided eyeball, Case 11.

the equator on the nasal side of the globe, one end probably cutting through the sclera. (Fig. VIII.)



*Operation.*—With a Hirschberg magnet, the point of which was introduced through a scleral wound at the inner side, a large piece of steel, which unfortunately has been lost and the weight of which is, therefore, unknown, was removed. The patient did extremely well for a time, but left

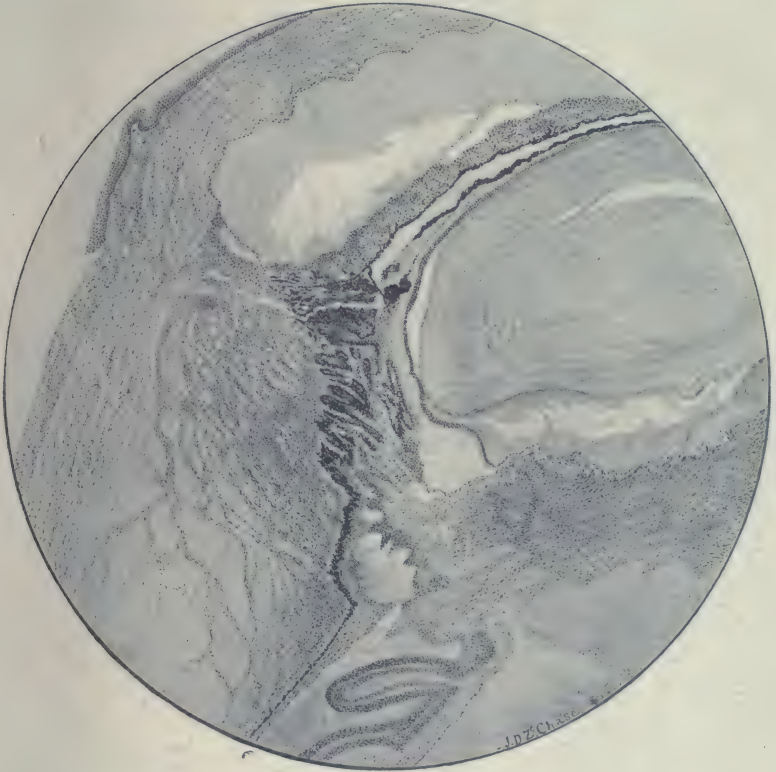


Fig. X.

Microscopic appearance of the divided eyeball, Case 11.

the hospital within a week after the operation against advice, exposed himself to a snow storm, and returned one month later with great increase of the iridocyclitis and beginning in-drawing of the scar of operation. Slight signs of sympathetic irritation in the opposite eye were evident and the injured organ was removed. The enucleated eye, after hardening in

formalin, was divided in equatorial section, and half submitted to microscopic examination and the other half mounted in glycerin-jelly. (Fig. IX.)

*Pathological Examination of the Enucléated Eye.*—The anterior chamber filled with exudate, and there is a wound evident just posterior to the ciliary region, with indrawn edges filled with scar-tissue. The cornea is distorted at this point and wrinkled, the retina is detached, the choroid shows haemorrhagic extravasations. Posterior to the lens there is a large mass of exudate. Microscopically the conditions are illustrated in the accompanying drawing. (Fig. X.)

The cornea is wrinkled and filled with cells, the iris infiltrated with cells, the ciliary body detached, and like the iris, shows an infiltration of large numbers of round cells, chiefly mononuclear in form and distributed in places in dense masses and in other places along the vessels. A mass of organized exudate exist behind the lens, into which the ciliary processes are drawn, with proliferation of their lining cells. The lens is cataractous and partly absorbed. The choroidal vessels are widely distended and filled with blood, which contain many polymorphonuclear cells. The vessels are surrounded by round cells. The retina is detached, there is a subretinal exudate, and in the retina are numerous round cells and some perivasculitis, while the retinal vessels contain polymorphonuclear cells. The retinal tissue itself is degenerated and oedematous.

*Remarks.*—From the pathological appearances just described it will be seen that they represent those which are typically concerned in the production of the so-called sympathetic inflammation, and indicate the fact that late extraction of the foreign body, after cyclitis is established, may often be unsuccessful to prevent the lesions which may eventuate in sympathetic disease, and illustrate forcibly the importance of early extraction of these foreign bodies.

CASE 12.—T. J. F., male, white, American, aged 35, while working with a lathe was struck in the left eye, and presented himself within two hours after the accident at the Jefferson College Hospital.

*Condition of the Eye.*—There was a small cut at the in-

ner ciliary region, and the anterior chamber and the vitreous so streaked with blood that ophthalmoscopic examination was impossible. Vision was reduced to counting fingers.

*Method of Localization.*—The patient was referred to Dr. Sweet for localization of the foreign body with the X-rays, but as the skiagram showed the presence of the foreign body, and as the case was entirely fresh, it did not seem worth while to wait for the exact plotting of the position of the body, and the eye was immediately submitted to operation.

*Operation.*—The original scleral incision was slightly enlarged, and with a Hirschberg magnet a small foreign body immediately withdrawn. This unfortunately has been lost and its weight cannot be given. Healing was prompt and uninterrupted, and after the absorption of the vitreous clots, aided by the administration of iodide of sodium and hot compresses, vision, after the correction of an existing myopia, was 6/6.

*Remarks.*—This is an excellent example of the importance of seeing patients with retained foreign bodies before infection of the wound or secondary inflammation of surrounding structures take place, and before the body has remained long enough to become surrounded by exudate. At the present time it would be impossible to tell that this patient has ever had an operation performed upon his eye for the removal of a foreign body.

CASE 13.—A. M., male, white, Italian, aged 30, five weeks before reporting for examination, while working with some metal, was struck in the right eye. Two days later he was examined by a local surgeon, who was unable to detect the presence of a foreign body, and who treated the eye expectantly.

*Condition of the Eye.*—Without dilatation of the pupil a few spots of opacity were found in the lens, and down and out in the retina a large haemorrhage in the neighborhood of the point of entrance of the foreign body, which existed as a wound downward and outward in the sclera. Elsewhere the retina was detached and the vitreous filled with floating opacities. The left eye was normal in all



respects. The patient was admitted to the University Hospital for treatment.

*Method of Localization.*—The patient was referred to Dr. Sweet for localization, who reported as follows:

Examination September 1, 1902. The foreign body is situated 15 mm. back of the center of the cornea, 4 mm. below the horizontal plane, and 6 mm. to the temporal side of the vertical plane. Fig. XI.

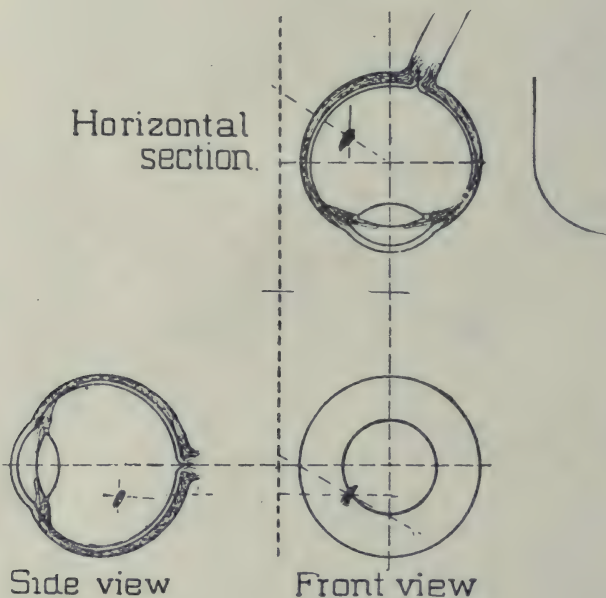


Fig. XI.

*Operation.*—A small incision was made with a Graefe cataract knife, about the width of the blade, over the region which the skiagram indicated as the probable position of the foreign body. The point of the magnet was not introduced within the wound, but only placed at its lips. Immediately the foreign body became attached to the magnet point. It weighed .0836 grams, or 1.29 grains. The patient was put to bed and the usual treatment instituted, healing being uninterrupted. At the end of two weeks the eye was white and

quiet, the retinal detachment unchanged, a slight increase in the lenticular opacity, and vision amounting to counting fingers excentrically.

CASE 14.—W. B., male, white, American, aged 20, while using a chisel, was struck with a flying bit of metal in the right eye, two months prior to his appearance for treatment. He was examined at the time, but a foreign body either not suspected or not found.

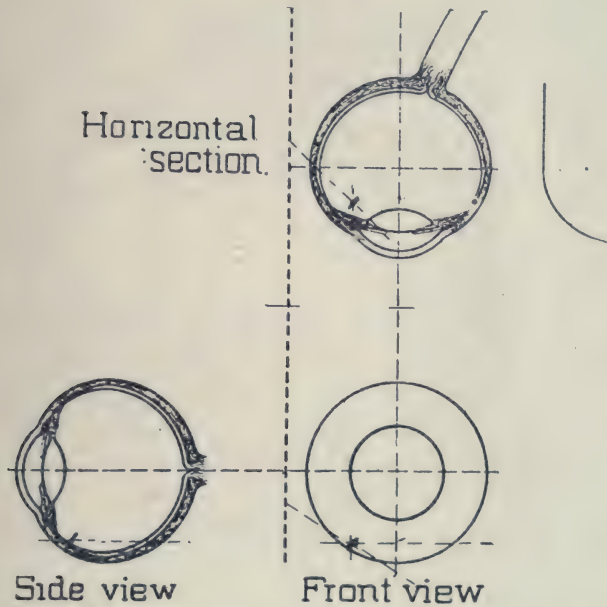


Fig. XII.

*Condition of the Eye.*—The iris was slightly discolored, there was a small scar representing the cut in the cornea upward and inward, and the lens was opaque. Vision equalled light perception, good in all proportions of the field.

*Method of Localization.*—The patient was referred to Dr. Sweet for skiagraphic examination, who reported as follows:

Examination September 6, 1902. The foreign body is thin  $2 \times 1\frac{1}{2}$  mm. It is situated 8 mm. back of the center of

the cornea, 9 mm. below the horizontal plane, and 6 mm. to the nasal side. Fig. XII.

*Operation.*—The body was removed through a small incision in the sclera, placed according to the localization, with a Sweet's magnet, which was approached to the lips of the wound but not introduced. The body weighed .0058 grams, or .09 grains. Three months later the cataract was extracted in the usual manner, without iridectomy. Healing was normal, and, with a suitable cataract glass, vision was 6/5.

CASE 15.—T. S., male, white, American, aged 25, reported at the University Hospital with the statement that six months before he had received an injury while working at his trade, that of a foundryman, but whether a foreign body had penetrated his eye or not he could not say.

*Condition of the Eye.*—Vision amounted to 6/60. There was a good deal of haze in the retina, and in the outer part below the macular region a mass of yellowish-white exudate containing a small black speck near its center could be seen, which probably represented a foreign body, and which undoubtedly was demonstrated to be a metallic body, because the point of a Sweet magnet applied to the sclera over the region named at once caused a sharp pain and the eye became attached to the magnet.

*Method of Localization.*—In addition to the demonstration just recited, as a matter of interest he was referred to Dr. Sweet for skiagraphic examination, who reported as follows:

Examination October 2, 1902. The size of the body is  $2 \times \frac{1}{2} \times \frac{1}{2}$  mm. It is situated 13 mm. back of the center of cornea, 10 mm. below the horizontal plane, and 5 mm. to the temporalside of the vertical plane. Fig. XIII.

*Operation.*—A small incision was made in the usual manner through the sclera, between the insertion of the inferior and external rectus and the point of the magnet applied, without, however, securing the foreign body. The point of the magnet was then introduced within the vitreous cavity three times, but unsuccessfully in so far as bringing to light the foreign body was concerned. The eye healed uninteruptedly and although there was a well marked retino-chor-



oiditis for some time, this gradually subsided and vision equal to that at his original visit and somewhat better is maintained at the present time. Numerous skiagraphic examinations made since have failed to reveal the slightest trace of foreign body, nor has any examination with the magnet indicated its presence. It may, therefore, be assumed that the body

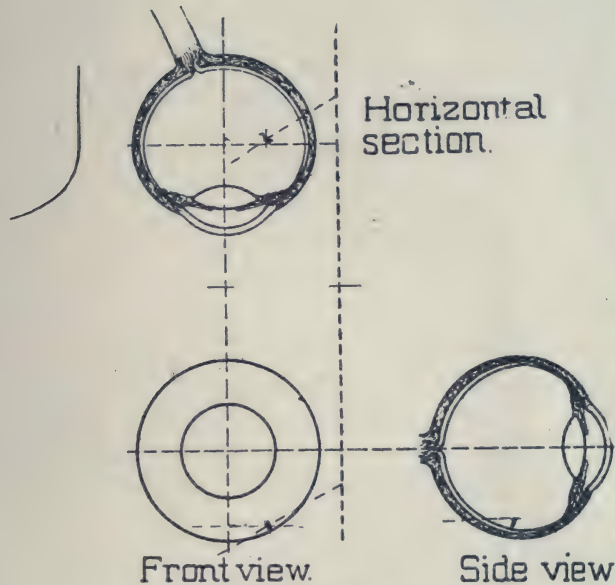


Fig. XIII.

was very small and in some manner escaped detection during the operation.

CASE 16.—J. B., male, white, American, aged 48, while working in a blacksmith shop, received an injury in the right eye, and submitted his eye to domestic medication, poultices and the like, reporting at the University Hospital two days after the injury, sent there by Dr. Craig, of Columbia.

*Condition of the Eye.*—There was a cut through the center of the cornea, the lens was opaque, the iris discolored, and there was a good-sized hypopyon at the bottom of the chamber.

*Method of Localization.*—The patient was not submitted to any method of localization, as it was determined to try and draw the body into the anterior chamber, should it exist in the eye.

*Operation.*—The point of a Sweet magnet was placed directly opposite the cornea, the current turned on, and almost immediately the foreign body appeared in the anterior chamber and was removed through the original corneal wound, slightly enlarged for that purpose. It weighed .0065 grams, or .1 grain. The chamber was washed out with physiological salt solution, and on two occasions packed with iodoform rods. At the second dressing the remains of the opaque crystalline lens were removed through the corneal incision and the rods again introduced. Healing took place slowly, and the iodoform treatment was successful in checking the spread of the infection, and the ultimate result was a sightless globe, with slight anterior phthisis, but to the patient this was a far more satisfactory result than an enucleation.

CASE 17.—W. D. G., male, white, American, aged 19, reported for examination at the University Hospital with traumatic cataract of the left eye.

*Condition of the Eye.*—The eye presented the ordinary appearances of traumatic cataract, with perfectly mobile iris and absence of ciliary irritation; light projection good in all portions of the field.

*Method of Localization.*—The patient was referred to Dr. Sweet for skiagraphic examination, who reported that there was a minute foreign body 5 mm. back of center of cornea, 3 mm. below the horizontal plane, and 1.5 mm. to temporal side of vertical plane, that is, in the lens. Fig. XIV.

*Operation.*—The lens was removed by the ordinary method, without iridectomy, and the point of the magnet applied to the lips of the cataract wound. The presence of the body on the end of its extension point after the current had been turned on was not demonstrated. Healing was uninterrupted, and a suitable cataract glass gave the patient a vision of 6/6.

CASE 18.—J. J., male, white, American, aged 27, was injured with a small piece of flying metal in the right eye,

and presented himself about thirty-six hours later at the University hospital.

*Condition of the Eye.*—The eyeball was already infected, the ragged corneal wound being infiltrated, while purulent material was seen at the anterior chamber and the iris inflamed and thickened.

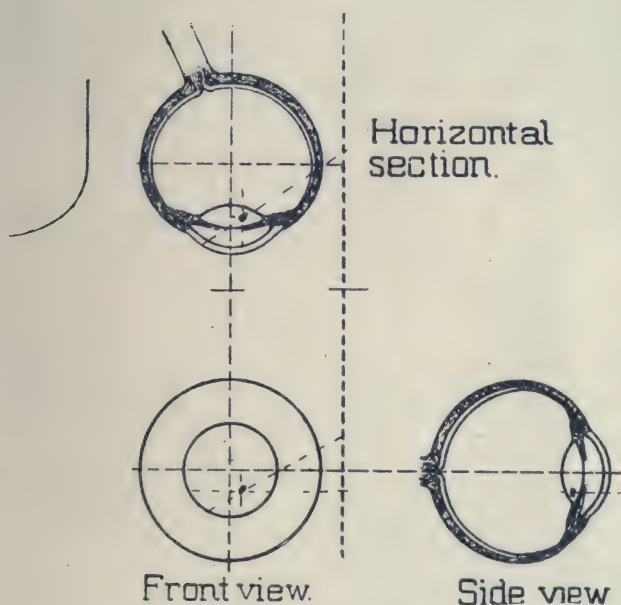


Fig. XIV.

*Method of Localization.*—The X-rays were not used to localize the body, but its presence was immediately detected with the magnet.

*Operation.*—With the Sweet magnet the foreign body was drawn into the anterior chamber and removed through the original wound. The chamber was washed out with normal salt solution and packed with iodoform rods. These, however, failed to check the extension of the suppuration, and after forty-eight hours of treatment, panophthalmitis being very evident, evisceration was performed. The foreign body unfortunately was lost and its weight cannot be given.



CASE 19.—J. S., male, white, Irish, aged 36, several months prior to his application for treatment, was spiking ties on a railroad and was struck with something in the right eye. He did not at the time know whether the fragment which struck him was a particle of metal or a bit of stone.

*Condition of the Eye.*—The eye presented the typical appearance of siderosis bulbi, the iris being of a rust-brown

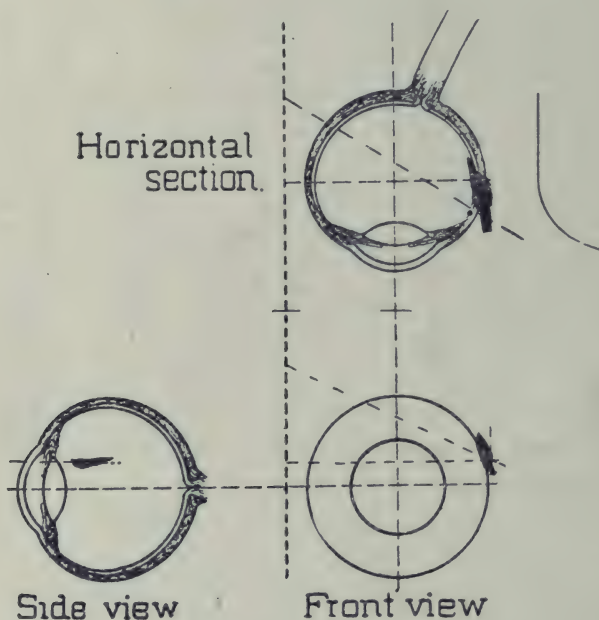


Fig. XV.

color, the lens cataractous and the vision faint light perception.

*Method of Localization.*—The patient was referred to Dr. Sweet for skiagraphic examination, who reported as follows:

Examination March 26, 1903. There is a foreign body 1.5 mm.  $\times$  4 mm. situated above the internal rectus tendon, partly in the sclera. Fig. XV.

*Operation.*—The conjunctiva was incised just above the insertion of the internal rectus muscle and the point of a

Sweet magnet applied to the incision. Almost at once there was drawn to the surface the end of what appeared to be a large piece of metal. It was, however, so tightly imbedded in the scleral tissue and partly within the eyeball itself that it was necessary before it could be extracted to make a small incision along its side through the sclera, when it was at once removed from its surroundings and proved to be a piece of metal  $1\frac{1}{2}$  cm. in length and 4 mm. in width, pointed at one end like an arrow. Its weight was .0982 grams, or 1.515 grains. The patient made an uninterrupted recovery, and left the hospital in forty-eight hours.

CASE 20.—W. Z., male, white, American, aged 61, presented himself at the University Hospital with the history that about twenty-four hours previously, while hammering on a nail, he was struck in the left eye with what was supposed to be a piece of metal.

*Condition of the Eye.*—There was a cut in the center of the cornea, slightly ragged and diagonal, the anterior chamber partly filled with blood and the lens already becoming cataractous. Vision was light perception.

*Method of Localization.*—The X-rays were not employed for the purpose of localization, but the body was detected by means of the magnet.

*Operation.*—The point of a Sweet magnet was applied to the center of the cornea, and almost immediately the foreign body appeared between the edge of the iris and the surface of the lens, and was drawn into the anterior chamber and extracted without difficulty through the wound. Immediately following the extraction there was a sharp haemorrhage, filling the anterior chamber and evidently filling also the vitreous, as the the tension of the eyeball rose rapidly and the pain became intense. Under the use of hot compression and hypodermics of morphia this pain gradually subsided, and although on two occasions there was renewal of the haemorrhage, associated with marked chemosis of the bulbar conjunctiva, there was no suppuration, and gradually the reaction subsided and the eyeball became quiet with the ordinary appearances of phthisis bulbi. The foreign body weighed .0065 grams, or .1 grains.

CASE 21.—J. Jeffries, male, white, American, aged 15, while working in a cooper's shop and hammering upon an iron hoop, sustained an injury of the left eye, and presented himself within the first twenty-four hours at the University Hospital.

*Condition of the Eye.*—There was a small cut in the center of the cornea and the lens swollen and cataractous. Vision was light perception.

*Method of Localization.*—The patient was not submitted to X-ray examination, but the body diagnosed by means of the magnet.

*Operation.*—In the usual manner with the Sweet magnet the body was drawn into the anterior chamber, and came from a position just posterior to the lens in the anterior layers of the vitreous, and was removed through the original wound in the cornea from the anterior chamber. The patient made an uninterrupted recovery, and there was a natural absorption of the traumatic cataract, very much as after a dissection, with a vision of 6/15. The foreign body weighed 0.0162 grams, or 0.25 grains.

CASE 22.—A. F., male, white, American, aged 48, while cutting stone with a steel chisel, was injured in the right eye, the foreign body penetrating through the cornea and passing apparently into the upper ciliary region. He was referred to the University Hospital by Dr. Schum, and reported about 48 hours after the injury.

*Condition of the Eye.*—There was general bulbar injection, a wound in the upper corneo-scleral region and a cataractous lens. A slight ciliary flush indicated the beginning of iritis.

*Method of Localization.*—The patient was referred to Dr. Pancoast of the University Hospital for X-ray examination, who reported that the foreign body was situated posterior to the lens in the upper ciliary region.

*Operation.*—A small incision in the sclera over the region indicated by the localization was made and to it was applied the tip of a Sweet magnet. Immediately the foreign body was withdrawn, which measured 2 1/2 mm. in length. 1 1/2 mm. in width and weighed .0246 grams, or .38 grains. The healing was uninterrupted, and the patient returned to



his physician with a useful eye, the lens of which, however, was cataractous, vision being light perception in all portions of the field.

CASE 23.—F. C., male, white, French, aged 31, while working in a machine shop, was injured by a piece of flying metal striking him in the left eye, and presented himself within twelve hours after the accident at the University Hospital. An irregular cut in the center of the cornea, traumatic cataract, and haemorrhage into the anterior chamber were evident.

*Method of Localization.*—The eye was not submitted to X-ray examination, but the body was localized by means of the magnet.

*Operation.*—The operation was performed by Dr. Mellor, who, by means of a Sweet magnet, drew the body, which had been situated, apparently, at a position posterior to the lens, into the anterior chamber and extracted it through the original wound. There was for some time afterwards a sharp traumatic iritis, which gradually subsided, and at the present time the eye is perfectly white and quiet, with good light perception in all portions of the field.

CASE 24.—J. D., male, white, Irish, aged 22, came to the University Hospital with the history that two days previously, while working in a cellar where there were some old boxes, he had been injured with a bit of metal which flew either from the head of the hammer, or from some of the iron bands upon which he was striking.

*Condition of the Eye.*—The eye showed well-marked beginning panophthalmitis, the conjunctiva being chemotic, the cornea containing a ring-like infiltration. the iris thickened and purulent.

*Method of Localization.*—The eye was not submitted to X-ray examination as it was hopelessly infected, but immediately examined with the magnet.

*Operation.*—After the foreign body had been drawn into the anterior chamber and extracted, the eyeball was eviscerated and the vitreous found thickly infiltrated with purulent material. Examination of this purulent material showed in addition to a streptococcus infection a marked growth of

the bacillus subtilis. The body weighed .023 grams, or .355 grains.

CASE 25.—A. H, male, white, American, aged 18, while working in a machine shop, was struck in the right eye with a bit of flying metal, and presented himself within twelve hours at the University Hospital.

*Condition of the Eye.*—There was a small cut near the corneo-scleral margin and the foreign body seen in the anterior chamber in contact with the iris.

*Method of Localization.*—No method of localization was required as the body was visible. The operation was performed by Dr. Mellor, who after making a small incision after the manner of that which is utilized in the performance of iridectomy, extracted the body with a small hand magnet. Healing was uninterrupted and the vision normal when the eye had become quiet,

CASE 26.—John G., male, white, American, aged 19, while working in a wire factory three weeks prior to his examination, was struck with a bit of metal which flew either from the hammer he was using or from the wire upon which he was striking.

*Condition of the Eye.*—The closest inspection failed to reveal any point of entrance of the foreign body, indeed, it was believed that there was no foreign body present. The iris was mobile, the eye in good condition and the vision 6/5. Examination with the dilated pupil showed in the upper and inner portion of the eyeground, 3 disc's diameter from the edge of the papilla above the macular region, a metallic body suspended by two delicate, thread-like strings from a circular white exudate. The exudate was surrounded by an area of choroiditis. The foreign body suspended thus in the vitreous could easily be seen with + 8 D. The appearances are depicted in the accompanying water color. (Fig. XVI.)

*Method of Localization.*—The method of localization was by direct inspection with the ophthalmoscope in the manner already described.

*Operation.*—The foreign body was readily removed through a small incision in the sclera placed slightly posterior to the ciliary body and midway between the internal and superior rectus, the point of a Sweet magnet being applied to the lips

of the wound, but not inserted into the vitreous. The body weighed .02 grains.

*General Remarks.*—Coming to a more intimate analysis of the material reported, we observe that in the 26 cases the right eye was injured 14 times and the left eye 12 times. The situation of these foreign bodies in general terms may be stated to have been as follows:

In the anterior chamber	-	-	1
In the lens	-	-	1
In the ciliary region	-	-	6
At or near the equator	-	-	9
In the posterior part of the eye	-	-	9

The ultimate visual result in these cases was as follows:

6/60, 1; 6/15, 2; 6/9, 1; 6/6, 6; counting fingers, 1; light perception with preservation of shape of eyeball, 5; phthisis bulbi, 2; enucleation or evisceration, 8.

Referring to the successes, that is, to those patients who after the operation had a vision of 6/60 or better, we find that the body was situated in the anterior chamber once, in the lens once, in the ciliary region three times, near the equator once, and in the posterior portion of the eye four times. One of the cases, which originally had a vision of 6/15, was seen later, about two months after the operation, and hyalitis had supervened and retinal detachment occurred. The patients who retained the normal configuration of the ball with a vision, either of light perception or counting fingers, could probably in all instances have had their visual acuity improved by extraction of a cataractous lens, but in no instance was this operation performed, and in some cases although advised it was not permitted. Of the two cases of phthisis bulbi, one was caused by successive intraocular haemorrhages, and the other came to the hospital with an infected cornea and iris, and the eyeball was saved after the extraction of the foreign body by Haab's method of placing iodoform rods within the anterior chamber, a method, however, which failed in another similar but more infected case.

Enucleation or evisceration was necessary in eight of the cases, either as an immediate procedure, or sometime after the removal of the body, in order to relieve the pain of an irritable stump, or to prevent sympathetic irritation. In al



of these cases the patients came under observation either after the body had been long situated within the ocular coats, in one instance for eighteen years, or when marked iridocyclitis or infection of the eyeball was already apparent.

Reverting to the length of time the body had existed in the eye before it was removed with the magnet, we have the following results:

Two hours, 1; three hours, 1; twelve hours, 1; one day, 7; two days, 6; three days, 1; seven days, 1; twelve days, 1; three weeks, 1; five weeks, 1; two months, 1; six months, 2; eight months, 1; eighteen years, 1.

It need hardly be pointed out that the length of time quoted is only approximately correct, for example, some of the cases which are noted as having come for treatment at the end of twenty-four hours may have come twenty-two or twenty-three hours exactly after the accident. It is often very difficult to ascertain from patients minute details of this character.

Counting as successful all those cases in which the eyeball was preserved with a vision of light perception or better, we find that the patient reported within three hours after the accident in 1 case; two in 2 cases; twenty-four hours in 4 cases; two hours in 1 case; five weeks in 1 case; two months in 1 case; six months in 2 cases; eight months in one case; twelve hours in 1 case; three weeks in 1 case.

Therefore, it would seem that the mere length of time the body has resided within the ocular coats need not necessarily influence the ultimate visual result, provided its residence there has not caused inflammation, or that it has not carried with it an infection, and provided that it has not become surrounded with exudate, rendering its removal impossible. Naturally, other things being equal, in the absence of infection, the sooner the body is removed the more likely is the result to be a good one, and yet the most active form of infection may become implanted within a few hours, as, for example, Case 18, and Case 24, and the eye be lost in spite of removal of the body and most vigorous treatment to prevent progression of the infection.

The foreign body was visible in the anterior chamber once, in the angle of the anterior chamber and partially im-

bedded in the ciliary region once, in the posterior portion of the eye through the clear media by means of the ophthalmoscope once, and, therefore, no method of localization other than direct inspection and ophthalmoscopic examination was required in these cases. The body was localized by means of the X-rays 15 times. Thirteen of these examinations were made by Dr. Sweet, one by Dr. Pancoast and one by Dr. Max Stern, and all of the examinations except the one by Dr. Stern, according to the method devised by Dr. Sweet. In each of these instances the body was found exactly in the position indicated by the skiagraphic examination.

In 13 of the 26 operations the extension point of the magnet was introduced into the vitreous. Of these 7 eyes were saved\* and 6 were lost. In one of the "saved" eyes there was later a detachment of the retina. In 6 of the 26 operations the extension point of a Sweet magnet was applied at or near the lips of a suitably placed scleral incision, and all of these eyes were saved.

In 7 of the 26 operations the body was drawn into the anterior chamber. Of these eyes 5 were saved and 2 were lost. Both of the eyes noted as lost were, however, infected when they came under observation and their loss cannot be attributed to the operation. It is interesting to note that there were no failures when the body was drawn through a properly placed small incision in the sclera; but if the 2 eyes already hopelessly infected when they first were examined be excluded from the series of operations in which the body was drawn into the anterior chamber, there were also no losses with this method. The number of operations, however, is too small to permit the formulation of deductions on this point. It would seem to me from my own experience and from my observation of cases operated upon by my colleagues that each eye must be dealt with according to the conditions present when it is first examined. Of this I am persuaded that, if the foreign body can be accurately localized by the Roentgen rays, according to Sweet's method, or any other satisfactory method, and the position of the body be found to be such that a small incision may be made directly

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\*The word "saved" indicates that neither enucleation nor evisceration was required.

over it, or in its immediate neighborhood, through which it is drawn by a magnet—the Sweet model has proved most satisfactory—without the introduction of the instrument into the vitreous, the results are just as good as when the attraction of a giant magnet conducts the body from its place in the posterior part of the eye around the lens into the anterior chamber, from which it is subsequently removed. I am further persuaded that what I may call direct extraction after suitable localization presents no greater danger than the other method, and in many instances a danger not so great. Moreover, the traumatism of the delicate incision in the sclera to which the body proceeds by the shortest route is not greater, and, it seems to me, not so great as that produced by the body when it takes a long route into the anterior chamber, from which it must be removed by incision.

As I have already stated, each case is a separate problem, and if the foreign body, for example, has penetrated the cornea and lens and traumatic cataract already exists, it is, of course, to a certain extent a matter of indifference whether the foreign body in coming forward should wound the already injured lens. Again, careful examination will often reveal that the easiest route through which the body may be attracted by the magnet is the one which has proved to be the pathway of entrance. But under any circumstances the value of accurate localization, whether the giant magnet be used according to the Haab method, or whether an incision be made over the approximate position of the piece of metal, must add to the facility of the technique, and I agree with Dr. Sweet in his various publications on this subject, that localization by means of the X-rays is always an advantage to the patient and to the surgeon.

My own results are as follows: Eyes saved with good vision 38.4; eyes lost 30.8; eyes saved, which probably could have been improved by subsequent operations, 23 per cent.; eyes saved, but the ball somewhat shrunken, that is, phthisis bulbi, 7.7 per cent.

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#### NOTICE.

The American Academy of Ophthalmology and Oto-Laryngology will hold its 10th annual meeting at Buffalo, N. Y., **On September 14th, 15th and 16th, (1905)** (Thursday, Friday and Saturday), instead of August 23rd to 25th as previously announced.

Dr. Alvin A. Hubbell, 212 Franklin St., Buffalo, N. Y., is Chairman of the Committee of Arrangements.



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## ORIGINAL ARTICLES.

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### ECTOPIA LENTIS WITH APPARENT POWER OF ACCOMMODATION.

BY J. W. CHARLES, M.D.,

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ACCORDING to d'Oench (Archiv f. Aug. IX 2 S. 31, Ref. Michel, 1881, p. 197, vol. 10) ectopia lentis has the following characteristics:

1. It is a developmental fault, cause not explained.
2. It affects always both eyes, generally symmetrical.
3. The lenses are generally clear, often smaller than normal.

4. The zonule may or may not be wanting.

5. Myopia in 25 per cent.

6. Heredity has been demonstrated as an etiologic factor.

Last year Dr. G. Griffin Lewis (Arch. of Ophth., Vol. xxxiii, No. 3), gave a report of sixteen individuals affected in six successive generations.

Record of Daniel H., September 25, 1904.—Patient is six years old. He does not learn readily in school. I find his corneæ large, the diameter of their base being 14 mm. Irides tremulous. Measurement with ophthalmometer unsat-

isfactory. The ophthalmoscope gives downward dislocation of the lens, right and left, with many bundles of the zonule to be seen converging from the ciliary region to the upper lense-margin and moving with the lens. All subjective tests are unsatisfactory.

September 6th—With + 15.D Sph.  $V = 15/42$  R. or L. These glasses were prescribed.

I am indebted to Dr. A. E. Ewing for the record of the patient's father, which is as follows:

“Michael H. October 8, 1898. Never could see well. Was never able to do much at school on account of bad sight.

O. D. As 1. M vertl.

O. S. As 1. + M ax.  $30^\circ$  Javal, good light.

O. D. Aphakia, lens in lower portion of fundus.

O. S. Ectopia lentis downward and inward. Lens covers about  $\frac{3}{4}$  of the pupil. Each iris tremulous.

O. D. Very poor vision, even when corrected.

O. S.  $V = 14/48$ . The same with + 1. cyl. ax.  $-30^\circ$ .

October 9th. Vision as on 8th. Pt. reads most easily with + 2. Sph. + 1. cyl. ax.  $30^\circ$ . After the use of Pilocarpine grij to  $\mathfrak{z}j$  for  $1\frac{1}{2}$  hours, O. D., with + 1. cyl. ax.  $30^\circ$ ,  $V = 14/75$ . With  $-1.5$  Sph. added,  $V = 14/48$ .

1895, May 16th. O. D. No satisfactory result. O. S.  $V = 20/75$ . With + 1. cyl. ax.  $-30^\circ$ ,  $V = 20/75 +$ .

I have advised strongly against any surgical interference with the eyes unless there are other indications for it than at present. He will bear no change in glasses.”

Marie H., daughter of Michael, was  $6\frac{1}{2}$  years old when she came to me in February, 1898. She has never seen as well as others. Ophthalmometer—As 1. M. vertl. R. & L. This measurement was doubtful, because patient had never learned to fix accurately. Irides are tremulous, O. D. less than O. S. The ophthalmoscope shows downward dislocation of the lenses. The fibres of the zonule of Zinn are plainly seen extending from above downward to the lense-margin. The lenses float upward with each movement of the eye. With + 16 D. Sph. R. or L.,  $V =$  digits at 16 ft. Later with + 16 D. Sph. R. or L.,  $V = 15/42$ . I prescribed + 16 D. Sph. R. or L.

April 12. O. D. V = 15/42. Glass bears no addition. O. S. V = 15/30. Glass seems to bear addition of + 1.5 Sph.

1899, July 12th. With + 17 D. Sph. R. or L., V = 15/24. I ordered + 17 D. Sph. R. and L.

October 26th. With glasses, V = 15/19 R. or L. With these the patient reads Jaeger No. 2 by turning her head to one side. Ophthalmometer—O. D. about 1 D. M. vertical. O. S. V. very unsteady.

1900, September 26th. Patient reads Jaeger No. 1 at 3 in. and at 1 ft. with the glasses.

1901, April 11. Wishing to learn if the ciliary muscle were sufficiently developed to change the curvature of the cornea by constriction of its base (which may barely be possible in so young a subject), I examined both eyes with the ophthalmometer, but found no change in the size of the images of the mires, whether the patient looked at the edge of the tube or passed it into the distance.

I then used atropin several times, after which patient reads J. 1 at 6 in. as before its use. She also closes down the brows and lids when reading, either for the purpose of pressure or in order to shut out light. When I raise her brow with my thumb, she can no longer read. After relaxing the pressure, she reads J. No. 1 with + 4 D. Sph. added. Upon removing + 4 D. Sph., patient cannot at first see J. 1, but after contraction again, she can do so. This test then seems to show that the pressure of extrinsic muscles was at least a factor in enabling her to read.

1902, October 23rd. O. D. with + 17 D. Sph. V = 15/15. O. S. with + 18 D. Sph. V = 15/15. I ordered the change of the glass O. S. to + 18 D.

The chief points of interest regarding this case are:

1. The dislocation is congenital and downward. According to Lippell, lateral and upward displacements are usually congenital, downward, almost constantly acquired, *i. e.*, caused by trauma or disease (Ref. G. Griffin Lewis).

2. The increase of visual acuity from 15/42 R. & L. with the only glass accepted by the patient, to 15/15 within three years and that in an eye so highly hyperopic, a condition which is in itself an expression of a want of development.



3. The seeming power of accommodation, the source of which ability has been much discussed by many writers.

In Michel's *Jahresbericht*, 1872, I find that Donders demonstrated that the optical focussing of the aphakic eye for near objects remains the same, but the narrowing of the pupil comes to the aid of distinct vision by diminishing spherical aberration:

Also that Foerster (*Klin. Monatsbl. f. Aug.* X, p. 39-56), however, reaffirmed that "especially youths attain, after some years, a certain degree of accommodative ability. But a source of error has been recognized in the fact that the reading of medium or fine print within a certain range only shows a greater aptitude in perceiving indistinct images, but in no way proves a change in refraction. A maximum perception must be maintained at different distances to demonstrate a change in refraction, and that in the absence of spherical aberration. The coincidence that in youth accommodation is so effective and that in youth the apparent accommodation of aphakics is most pronounced proves nothing, because of the presence of the lens in the one case and its absence in the other. Clearer media, more movable pupils, greater skill in deciphering, Ref. gives as possible aids to more perfect perception."

Foerster gave the occasional micropsia after operation as an evidence of accommodation. Ref. "admits the probability that a contraction of the ciliary muscle does stretch and displace the choroid but holds that the micropsia does not prove any optical focussing."

Abadie (*Journ. d'Ophth.* 1, p. 427, Ref. Michel, 1872) believed that the contraction of the pupil explains a greater part of apparent accommodation, saying that for reading one needs no sharp images and that within limits spherical aberration need not be suppressed.

Coert (*Utrecht Bijbladen* [Ref. Michel]) adjusted the eye for a certain distance by means of a glass. He then proved that visual acuity decreased as the distance increased from this focussing distance. If at a given distance within the apparent range of accommodation, a glass is placed quickly before the eye corresponding to this distance the print appears sharp and black which before was scarcely recognized. This could not have been the case if perception had been by

means of accommodation. Atropine diminished the apparent accommodation only so far as the pupillary surface became more unfavorable; once he even found an increase. Individual differences in the range of "distinction" rest upon differences in size and mobility of the pupil and other side influences which affect vision, *e. g.*, spherical aberration, etc. (The greater the acuity just so much more rapidly does it decrease by insufficient focussing, because the small letters used do not bear any spherical aberration.) The gradual increase of apparent accommodation after operation is explained by the real increase in vision. He demonstrated, both in reading tests and by exhibiting spherical aberration circles on a screen, that even aphakics had a certain range of acuity, in spite of diffusion circles.

Schweiger, 1875, says: "Since under physiological conditions the phenomena observed in the lens at least play the most important role in accommodation, the conclusion appears unavoidable that aphakia must result in a total loss of accommodation." "Coccius lays weight upon the fact that in many men the eyes advance somewhat in near vision and recede in distant vision, and since he established the same in a case observed by him of accommodation in aphakia, he considers it probable that by retraction of the globe by means of the recti, and pressure from behind, the eye becomes farsighted, by advancement of the eye by means of the oblique and discontinuance of pressure, with slight lengthening of the eye-axis, accommodated for near seeing."

Landolt maintained that any apparent accommodation which takes place is brought about by some change in the distance of the cataract-glass from the eye, stating, *e. g.*, that the power of a + 13 D. Sph. is increased to + 16 D. Sph. by removing it 35 mm. forward.

In our case this possibility was entirely eliminated, the glass remaining constantly at one distance with the exception of, perhaps, a few mm. by turning the head and looking through the side of the glass.

Schloesser (Muench. med. Wochenschr., Michel, Jahresb., 1893), found accommodation in several aphakics. One read with distance-glasses the finest print, J. 1 at 50 cm. Young aphakics have the ability more marked than older. He be-

lieved that he excluded such sources as inclining the head, or page, and clinching the lids, concluding finally that the most probable cause was the lengthening of the globe by pressure from the external muscles, hence older patients have less range, because of the greater rigidity of their sclera.

Hofhammer (Michel's *Jahresb.* 1894), examined 40 aphakics and found considerable accommodation, especially if the operation had been done some time before testing. Age had no appreciable influence.

Fuchs (Textbook, pg. 699). "The aphakic eye is more-over destitute of accommodation. The eye is incapable of altering its refraction. Hence it follows that by any single glass, the latter is corrected for a single distance only."

Von Arlt (Graefe-Saemisch Bd. III, 1, pg. 250). "If aphakic eyes possess any accommodation, it can only result from a change in the form of the globe," and he adds, "after extraction the visual axis might be somewhat longer, the equatorial diameter shorter."

Schoeler (Ref. Michel, 1875, p. 83), examined 10 cases "measuring the range within which the finest Burchardt point-tests (still recognizable) could be seen with a cataract-glass without noticeable suffering in distinctness. This range was so small that all thought of an accommodative influence must be given up (5 1/2 in. to 5 in. of 4 1/4 in. to 3 3/4 in.)."

Mauthner declared against aphakic accommodation after using Burchardt's point-tests and ophthalmoscopic examinations.

O. Walter (Archives of Ophthalmology, Nov., 1900) reasoned as follows: By contraction of the ciliary muscle and with it of the choroid (Hensen and Voelckers) the vitreous comes forward against the iris and in some cases protrudes through the pupil into the anterior chamber the size and shape of its bead varying with the size of the pupil. Considering the refractive index of the aqueous and vitreous as almost equal, he computes the necessary increase in the length of the globe at 2.7 mm., in order to read at 30 cm., if such increase in length were the only factor in accommodation. If, on the other hand, focussing is effected by a bead of vitreous, the surface of the latter must have the very small radius of 0.34 mm., and project through a pupil of



only 0.68. Therefore, he says that it is likely that the index of vitreous in such cases is greater than that of the aqueous.

Lohnstein (Knapp-Schweigger, 1900), answered that the spherical aberration of such a bead would be of too high a degree for distinct vision, and refers him to Boehmer's statement that a 1 per cent. salt solution has only an 0.00146 higher index than distilled water. "Therefore, the difference in the amount of salt present in different persons could alter the refractive index no more than  $+ 0.00015$ ."

It seems then that all of the theories which endeavor to explain aphakic accommodation by supposing some phenomenon in the eye, as, e. g., a change of shape in the globe, are opposed by as strong arguments as are brought forward in their favor. There remains only one factor not yet mentioned in this connection as far as I know, viz., the tipping of the cataract-glass or the equivalent thereof, looking obliquely through it, causing a greater curvature in one meridian, and visual acuity is increased by the ability of the patient to overcome spherical aberration through diminution of the palpebral fissure. Dr. John Green in the Transactions of the American Ophthalmological Society, Vol. V, Part III, in an article entitled "An Elementary Discussion of Some Cases of Centrical Refraction through Tipped Spectacle-Lenses," has given us a method of computing the difference in power produced by tipping, closing with a table of refracting values for the tipping-angle from  $5^{\circ}$  to  $45^{\circ}$ .

Since this paper was written, both of these patients have again been examined.—Daniel has now a vision of  $15/30 +$  R. or L., and can now distinguish some letters from Jaeger No. 1 by turning the head to one side.

Marie can now read J. 1 without turning the head or closing the lids and raising the brow and the lid has no influence on her vision.

## DOUBLE RADIAL RUPTURE OF THE IRIS.\*

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THIS case of double radial rupture of the iris is very remarkable and, so far as I have consulted the literature on the subject, there is only one which corresponds to it. In that case, which occurred in the practice of Dr. Büniger,<sup>1</sup> in 1821, the left eye was struck by a chain, causing an artificial pupil which could be distinguished from one made by an operation, only by a band of iris remaining at the ciliary margin. At first, sight was very much impaired, probably from intraocular hæmorrhage, but perfect vision was finally regained.

My case is as follows:

*History.*—G. H., age 10, was first examined November 12, 1902, and gave the following account of the accident: He was struck by a BB shot from an airgun at a distance of about five feet. The shot struck the edge of the lower lid of the left eye at about its anterior third. It embedded itself in the bulbs of the cilia and almost passed through. It was removed at home by squeezing the lid, when it dropped out. I saw the boy five days later and found a well-defined coloboma of the iris as clean and sharply cut as if it had been done by an expert. It was about 4 mm. in width. There was no blood in the anterior chamber, and only a moderate injection of the conjunctiva. Lying in the coloboma was a mass of iris tissue which was entirely separated from the iris on both sides as well as from its ciliary attachment (Fig. 1). The lens was opaque and vision was reduced to perception of light, probably on account of intraocular hæmorrhage. Tension was normal and the eye not painful. In my judgment the posterior lens capsule was ruptured, as there was no evi-

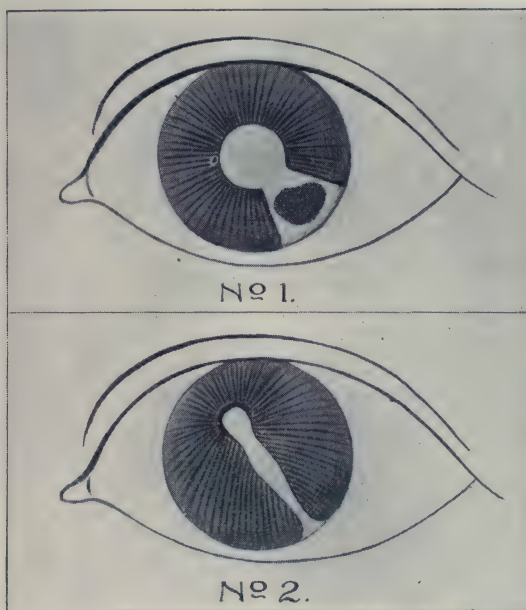
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\* Read at the Fifty-fifth Annual Session of the American Medical Association, in the Section of Ophthalmology.

1. Graefe and Walther: Jour. d. Chir. und Augenheilk., vol. ii, p. 669.

dence of soft lens substance in the anterior chamber at any time. Atropin was ordered.

In the course of time the edges of the coloboma gradually approached each other and the upper and inner portions of the iris drew up, leaving a long slit-like scar marked by a gray line of cicatricial tissue. (Fig. 2). The iris mass shriveled up and disappeared under the approaching edges of the iris. In three months he was able to count fingers at one foot and at the end of a year he could count fingers at three feet.



The iris at the end of the scar responds to light and probably an iridectomy made at that point would restore useful vision.

I shall not attempt a review of the literature on this subject, but will only refer to the various papers which have been written.

Dr. E. Franke<sup>2</sup> reports 13 cases of rupture of the sphincter iridis, including an original one in his own practice. He discusses the mechanism of rupture of the choroid, and gives the opinion of some of the most eminent men on that subject.



Prof. L. Weiss and Dr. W. Klingelhoeffer<sup>3</sup> collected 31 cases of rupture of the iris, including two original ones. They review the literature up to date. Their Case 1 is credited to Stellwag, but it really belongs to Büniger. Stellwag reviewed this case in an article published in 1855, as stated in the paper by Dr. E. Franke.<sup>2</sup>

The 31 cases are arranged chronologically, giving age of patient, name of author, cause of injury, condition of iris and pupil and complications. It is a valuable collection, and one can, at a glance, review this interesting group of accidents.

Dr. George Levinsohn<sup>4</sup> of Berlin, in a paper on "Indirect Ruptures of the Iris," reports four new cases. In the first, there were three ruptures of the pigmented pupillary margin; in the second, there was a slight rupture of the pupillary margin and multiple perforations of the iris in the region of the dilator; in the third case, there were multiple slight ruptures of the pigment border; in the fourth case, the iris was atrophic from recurrent attacks of iritis. An iridectomy was attempted, but only small bits of iris could be removed. As a result of the operation, the pupil was drawn upward and the lower portion of the iris near its ciliary margin ruptured, thus giving him a small pupil. The case does not properly belong to the class of traumata as do the others.

Dr. George C. Harlan<sup>5</sup> reports a case of "Rupture of the Iris at the Pupillary Margin and in Continuity from Contusion of the Eyeball." It is accompanied by an excellent illustration in colors. There was a notch in the temporal border of the iris, which extended to within 3 mm. of its periphery. There were also thirteen serrations in the margin of the pupil, which could be seen in favorable light. The lens was not injured. No iritis followed, and the eye recovered excellent vision. To this case he adds five more, stating that they formed six instances of pupillary rupture, and two of radiating rupture, in the continuity of the iris. These cases are tabulated by Weiss and Klingelhoeffer.

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2. Graefe's Archives, vol. xxxii, No. 2, p. 261.

3. Arch. f. Augenh., vol. xxxix, 1899.

4. Archiv f. Ophthal. vol. xxxii, 1903, p. 125, translated by Dr. Ward A. Holden.

5. Trans. Amer. Ophthal. Society, vol. vii, p. 640.

I find the following new cases which are not mentioned by Weiss and Klingelhoeffer.

Dr. W. F. Mittendorf<sup>6</sup> gives in detail a description of a patient who was accidentally struck in the eye by a stone, and, as a result of the injury, had six distinct ruptures of the pupillary border.

Woodward<sup>7</sup> relates a case of rupture of the pupillary border of the iris extending through one-half its width. There was an accompanying rupture of the choroid, which was in evidence when the intraocular hæmorrhage had absorbed. The eye made an excellent recovery, with perfect vision with the aid of + cyl. 0.5.

If, to the cases tabulated by Weiss and Klingelhoeffer, we add the four reported by Levinsohn and one by Woodward and one by Mittendorf, and my own case, we will have a total of 38 cases.

This probably does not represent all the cases of slight ruptures of the pupillary pigmented border, or of ruptures in continuity, which very easily escape observation. The elasticity of the iris is such that the slight tears readily close and are thus overlooked.

The question as to whether the rupture occurs in the direction of the force or perpendicular to it has been ably discussed by the authors mentioned.

It seems evident that no rule has ever been or probably ever will be formulated which will explain all of these cases. An eye is struck by a fist or by a flying fragment of wood or metal, and one can not tell definitely what part of the eye was most impinged on. The rupture of the iris may occur on the side of the injury or on the opposite side, and this result is governed by laws which are not yet well explained.

In my case there can be no question about the rupture occurring in the direction of the force and not perpendicular to it. The entrance of the pellet of lead into the margin of the lid and the location of the iridectomy coincide exactly. The detached piece of iris was lying in the coloboma plainly visible and could not be mistaken. The gray background of the opaque lens left no room for doubt.

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6. Trans. Amer. Ophthal. Society, 1899, vol. viii, p. 541.

7. Archiv f. Ophthal., 1897, vol. xxvi.

## REPORT OF SEVERAL EYE CASES.\*

BY L. R. CULBERTSON, M. D.,

ZANESVILLE, OHIO.

## CONGENITAL OPTIC ATROPHY.

CASE I.—Rev. W. T., age 37, minister. December 13, 1904. States that during his sermon last Sunday he suddenly lost his speech for about ten minutes. Never had laryngitis (examination of larynx shows no laryngitis or paralysis of vocal cords). Talks all right now. States that about eight years ago had nervous prostration and that when he would try to go to sleep he would “hear demons of hell,” and that this hallucination of hearing would disappear as soon as he would open his eyes. Has not had this since then. States that since an infant he has had to hold objects to within two inches of his eyes to read them, and that while studying divinity, and since then, he has read by holding a very large hand magnifying glass up to his eye and the print close to that to read. When he reads the paper touches his nose. His myopic astigmatism would not make him do this. He says his father was a drunkard and died blind and his sight was bad very early in life.

Pupils sluggish to direct light reflex. Consensual pupil reflexes normal, but sluggish, in all portions of the retina. Pupils contract normally to accommodation. No paresis of ocular muscles. Patellar reflexes exaggerated; no anaesthesia or paraesthesia, muscular sense normal. Romberg sign absent, walks in straight line eyes closed, no tabes. Carries a glass of water to lips without tremor, no nystagmus, no Charcot's disease.

Says he has recently had attacks in which he could not say what he wished to for some fifteen minutes (Aphasia). Also had an attack in which he could not recall the name of a dollar bill (said he could not remember what it was—amnesia). These attacks only lasted a short time.

\* Read before the meeting of the Eighth Councilor Dist. of Ohio Med. Ass., January, 1905.



Vision Rem. with — .75 Dey. 45 equals XX at 2 inches.

L. E. — 2 Dey. 135 equals XX at 4 inches.

Reads with magnifying glass. Sn. 1.5 at 1 inch.

Retinoscopy shows no hypermetropia. Ophthalmoscope shows each optic disc very pale and shows very marked atrophic cupping. Vessels quite small both on disc and in stroma retinae.

Diagnosis. Partial optic atrophy. Could not give encouragement, but put on strychnia, etc. Strychnia did not agree and bromide was substituted with benefit. I neglected to state that he never had syphilis and there is no evidence of it, either hereditary or acquired. Never used alcohol or tobacco.

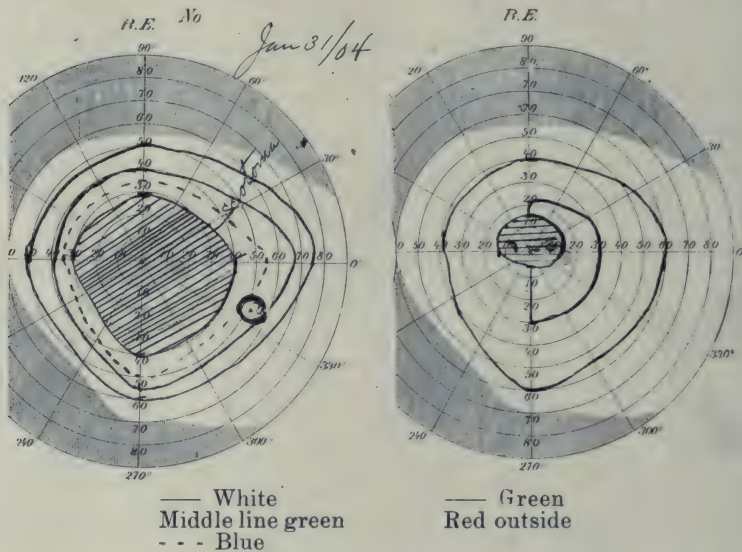
Visual fields not tested as he cannot tell any colors. Optic atrophy not connected with present brain trouble. His aphasia is due to defective intra-cranial circulation from thickening of arteries, or there is degeneration in the neurons which may result in paralysis or general paresis. Treatment advised was small doses of strychnine in conjunction with bromide.

#### MIXED MONOCULAR OPHTHALMOPLÉGIA.

CASE II.—Mrs. B. D., age 41, November 3, 1903, states that the left eyelid has been slightly droopy for some weeks, but yesterday the lid failed to open. Has been doing all of her housework and is very much run down in health. Says she has not had rheumatism, but complains of supra-orbital neuralgia and a pain along left side of nose. Also has neuralgia in left shoulder (musculo-spinal neuralgia—the latter symptom is nearly always found in cases of neuritis, so the neurologists tell us). Has complete ptosis of left eye and complete paralysis of left internal, superior and inferior recti and inferior oblique and sphincter iridis and ciliary muscle. This pupil does not contract to light but does to eserine. Consensual pupil reflex normal. All movements of right eye normal. No ptosis or paresis of iris or ciliary muscle. No anæsthesia or hyperæsthesia. Could not test color field of left eye to-day, but subsequent test showed it was not hysterical. Color field of right eye not hysterical. Color field of left eye taken January 14, 1904.

Ophthalmoscopic examination R. E. normal. L. E. slight haze about disc. Vessels normal in size and outline. Vision Rem. both normal. Urine s. g. 1003, no albumen, no sugar, no tube casts. Excess bladder epithelium, some uric acid.

Seat of lesion neuritis of trunk of third nerve (left) either in cranial cavity or orbit and due to neuritis. There is no history of syphilis. The absence of "choked disc" and the limitation of the symptoms to one eye and one nerve preclude diagnosis of tumor. Patellar reflexes normal. Romberg sign absent, walks in straight line, eyes closed; no tabes. Mind



and memory normal. The only motion of the left eye is outward. With + 4.5 D. Sp. to neutralize accommodative paresis she reads J. I.

Treatment: Strychnine in large doses, hypodermically and by mouth, absorbents, diuretics and diaphoretics.

January 14, 1904. No ptosis now, eye tires easily in looking up. Some paresis of accommodation and pupil.

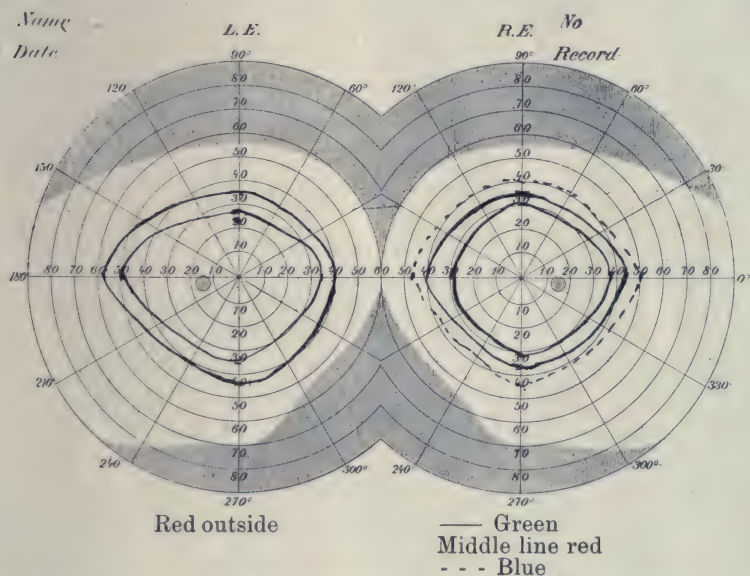
June, 1904. No paresis save slight paresis of accommodation. Pupil normal.

#### THROMBOSIS OF CENTRAL VEIN OF THE RETINA.

CASE III.—Mrs. J. S., age 77, January 25, 1904, suddenly became blind in the right eye while stooping and pok-

ing the fire. She has a fully mature cataract in the other eye and incipient cataract in the right eye. Sees one-half of my face very dimly with right eye. Says everything looks blue, mottled with gray and yellow. Urine s. g. 1012, no albumen, sugar or tube casts. No syphilis. She has been very rheumatic, gouty and dyspeptic for many years. Sees light on nasal side of right field and all parts of field with left eye. T. normal both.

Ophthalmoscopic examination: R. E. pupil dilates regularly to atropine; no synechia; incipient cataract, with + 18. D. in ophthalmoscope fundus distinct. Vitreous shows a few



opacities (with + 1 sp.). Arteria centralis retinae and smaller arteries somewhat enlarged. Vena centralis retinae and all smaller veins from three to four times normal size. Numerous retinal (venous) hæmorrhages, especially on the nasal side and near disc and macula; a few minute hæmorrhages on temporal half. Central scotoma for colors and light, also color fields contracted. (See charts.)

The family desired consultation and Dr. C. F. Clark of Columbus was called and made the same diagnosis.

Treatment: Mercurial inunctions, Burnham's iodine, general massage, arsenauro for several months, with steady improvement, then stopped all medicine. Seven months after she



could go alone on the street, work about the house and could read headlines on newspapers, but could not read smaller type because of scotoma.

Ophthalmoscopic examination made December 4, '04, shows all veins normal in outline and nothing to show that she ever had any thrombus or hæmorrhages save one or two very minute silvery spots on retina (nasal half) and one on macula. Veins apparently performing their function in a normal manner. The recovery was due either to early absorption of a portion of thrombus or to a collateral circulation having been established before the thrombus in the trunk of the vein was absorbed. Coates (Report of meeting, 1904, of Ophthalmological Society of the United Kingdom in the *Lancet*, July 16, 1904), reports "five cases with preparations. In four of these an organized thrombus was found in the central vein; in three of them complete obliteration of the vein in a portion of its course had occurred from this cause; and in one of them the manner of re-establishment of the lumen by the accession of collaterals from the trabeculæ of the nerve was well shown. In the fourth case, canalization and not obliteration of the thrombus had occurred. In the fifth no thrombus was found, probably because the optic nerve was cut longitudinally in the usual manner and not transversely, as was desirable when a lesion of the central vessel was suspected."

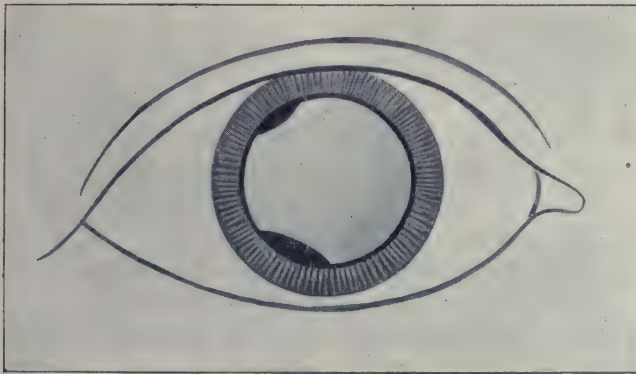
Dr. H. Knapp of New York giving statistics in 1884 (*Arch. Ophth.* XIII 1, p. 83) states "that the mortality in published cases is high, 29 per cent., and the prognosis as to sight exceedingly bad; 16 per cent. of the survivors lost the sight of both eyes, and 60 per cent. of them lost the sight of one eye. Incomplete recovery of sight occurred in 12 per cent. and complete recovery in 12 per cent."

DOUBLE COLOBOMA OF THE LENS WITH REPORT  
OF A CASE.

DR. S. C. AYRES.

CINCINNATI, OHIO.

COLOBOMA of the crystalline lens is one of the curious and interesting congenital defects of the eye. When it is associated with other anomalies as coloboma of the iris and choroid it is very likely to be detected if the eye is critically examined. When, however, it is not thus associated it may readily escape recognition. In Graefe's Archives, vol. 48, p. 558, Dr. Richard Kaempffer of Hamburg has a very inter-



esting and exhaustive article on Congenital Coloboma of the Lens. He reviews the literature on the subject from 1830 to 1899, the date of his publication. He collects 132 cases, including three of his own. The article is illustrated by 31 drawings, showing the peculiarities of the coloboma in the various rare cases. They present a very interesting study, and some of the illustrations show very exceptional defects in the development of the lens. These defects are sometimes in the shape of a triangular notch in the edge of the lens, or a saddle-shaped loss of substance, or a double notch

with curved edges. Among them is a very unusual case, originally reported by Dr. Christin of this city, in which there were three indentations in the edge of the lens, separated by two pointed elevations. From the tips of these elevations there extended directly outward delicate threads evidently remains of the zonula. In a case reported by Otto Becker (*Archiv Oph.*, vol. iv) there was a horseshoe-shaped furrow in the lens. In eight of these cases reported there was a double coloboma of the lens. Two of the three cases reported by Dor belong to one person, he having a double coloboma of the lens in each eye. Thirteen times both lenses were involved. The location of the coloboma is probably in a majority of cases below. In Kaempffer's list, where the locality is specified, it is below 53 times, above 11 times, outward twice, inward 5 times, below and in 6 times, below and out 8 times, once above and in and twice above and out. My own case is as follows: Miss L. H., not 18, was referred to me by Dr. J. C. Culbertson, December, '03, for a refraction test, as she had some asthenopic symptoms. R. E. V. = 15/30. L. E. V. = 15/10. With the shadow test she had mixed astigmatism — cyl. 0.5 ax. 25°  $\ominus$  + cyl. 1 ax 115° V = 15/20. In the left eye she had myopic astigmatism — cyl. 0.5 ax. 180° V = 15/15. In examining her by the direct method after the use of the mydriatic I noticed a double coloboma of the right lens, one break in the normal curvature of its edge being in the outer and upper quadrant and the other in the outer and lower quadrant. The lower and outer coloboma was the larger. There was nothing in her condition to lead me to suspect any defect in the least. The asthenopic symptoms were clearly due to her astigmatism and to an exophoria of 2°.

Kaempffer concludes that coloboma of the lens occurs more frequently than is generally supposed. This is due to the fact that it occurs in eyes which have good or fairly good vision and the defect is not sought for. This certainly is true of my case, as it was only by accident that I noticed the peculiarity of the lens.

Eyes with this defect are almost always myopic and often so in a high degree. Seldom are they emmetropic or hyperopic. In my case there was mixed astigmatism.



## MEDICAL SOCIETIES.

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### OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

JOHN TWEEDY P. R. C. S., President in the Chair.

*Thursday, February 9th, 1905.*

#### EXOSTOSIS OF THE ORBIT.

MR. EDGAR STEVENSON read a paper on a case of orbital exostosis.

The patient, a girl aged 22, was seen on November last with proptosis, well marked downwards and outwards, in the left eye. It had been first noticed six months previously, and its increase had been rather rapid. She had no pain except an occasional neuralgic twinge, the eye movements were unimpaired, the vision was normal and there was no diplopia. Under chloroform a small hard mass was felt lying under the outer and upper margin of the orbit. Upon operation it was found to be much larger than was expected; attached to the inner angle of the orbit, with its base in the frontal sinus, it extends right across the roof of the orbit. It was of cancellous tissue with a shell so hard that two drills were broken in an attempt to get into it; however, a small piece was removed with a chisel and showed its structure. The attached base was not very broad and the growth was wrenched away without difficulty. It was of an irregular pear-shape, weighing 351 gr., and measuring  $1\frac{1}{2}$  in. in its largest diameter. The patient made an excellent recovery; no eye affection remaining.

MR. A. OGILVY related notes of a case of large exostosis of the orbit. The patient, a healthy man aged 24, had no history of any ailment, and a good family history. When first seen, in November, he complained of epiphora, but on

examination a large hard mass was felt in the right orbit, evidently attached to the nasal side. The tumor was causing myopia and some choroidal changes. It had two pedicles, and its removal by operation proved difficult. The patient made an uninterrupted recovery, but diplopia was present; this, however, passed off in two weeks. The questions which the case raised were these:—(1) What was to be done with his disorganized lacrimal apparatus? (2) Did the tumor cause the myopia which had now disappeared? (3) Were these due to hereditary syphilis, as stated by Charles Stedman Bull? It was curious that so large a tumor could exist in such a small space as the orbit without causing more damage and discomfort than it did.

#### THE TREATMENT OF TOBACCO AMBLYOPIA.

MR. WRAY read a paper on the treatment of tobacco amblyopia. He divided the cases into three groups: (1) Those with amblyopia only; (2) those with amblyopia and tachycardia; and (3) those with tachycardia only. He urged that in view of the tendency to cardiac failure the pulse should always be examined. He had recently seen cases where the pulse ranged from 96 to 135, and patients suffering from tobacco poisoning should be warned that tachycardia might develop. The amblyopia usually disappeared if taken early, but by all the recognized treatments recovery was a slow process. As regards the tachycardia, he had seen several cases where it had persisted even after tobacco had been given up for years. He alluded to the toxic breath which was always present with amblyopia, but never when tachycardia was the sole symptom. He ascribed the amblyopia as probably due to saturation of the blood with tobacco alkaloids, and the tachycardia as due to injury or destruction of the cardio-inhibitory neurons of the trachea and bronchi, while bad teeth and a catarrhal condition of the alimentary and respiratory tracts aided the absorption of the poisons. Being much dissatisfied with the orthodox treatment with pot. iod. and strychnine, and considering that nicotine was freely soluble in water, he had suggested the following treatment. The patients were directed to dress warmly and drink a pint of water at 7 a. m., and walk briskly for thirty minutes in the

open air. Then to drink a second pint and go for a similar walk. Then rest for a few minutes and take breakfast. A third pint was to be taken in the middle of the morning, and a fourth in the middle of the afternoon. Some had even continued to smoke as much as  $\frac{1}{4}$  oz. a day, and in three cases practically normal vision was restored in fourteen days. As regards the effect of the water treatment on the heart, the author had not had the opportunity of trying it on the new cases he had lately seen, for this had not been a marked symptom in them, but unquestionably the accelerated beat he had noticed had not disappeared in the same way as the amblyopia. There was a considerable doubt as to the method in which nicotine was eliminated, but he thought that it was mostly by the kidneys, though the lungs and skin probably bore a share. The water treatment had the advantage of utilizing all three ways.

NEURO-FIBROMA OF THE EYEBALL AND ITS APPENDAGES.

MESSRS. E. TREACHER COLLINS and RAYNER D. BATTEN read a paper on neuro-fibroma of the eyeball and its appendages. The case which formed the basis of the paper was a girl aged 14, who had been under Mr. Batten's observation for three years. The right eye was buphthalmic with vision of  $\frac{1}{60}$ . There was also much hypertrophy of the upper lid. There was a doughy swelling over the right temporal fossa. The condition dated from birth. This unsightly eye was excised together with a wedge-shaped piece of the upper lid. The microscopical condition of the lid showed it to be a case of congenital elephantiasis associated with plexiform neuroma. The chief interest centered in the eye, for it was the fourth case recorded in which neuro-fibroma of the eyelid had been associated with a buphthalmic eyeball. This condition, however, did not seem to be due to fibromatosis of the ciliary nerves, but to increase in the tension, due, as in another case recorded by Mr. Collins, to congenital adhesion of the root of iris to the back of the cornea. The terminal nerves in the cornea were, however, thickened. The condition seen in the choroid had not before been noted. Throughout its structure was denser than normal, and in parts it was considerably thickened. It was chiefly composed of fibrous tissue, highly



nucleated, with pigment cells present, and very few blood vessels. Numerous small oval bodies presented the appearance of enlarged nerve ends. By comparison with the other cases recorded it was shown that all portions of the ciliary nerves supplying the eye might be affected with congenital fibromatosis, and that the uveal tract, like the skin, might be affected with a general hyperplasia of the fibrous tissue, though the extent of the affection varied. In some cases only the terminal filaments and end organs were involved, and in others the larger trunks were also affected.

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#### OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

A clinical evening was held on March 9th, Mr. John Tweedy, President, in the chair. Among the cases shown were the following: Mr. Edgar Chatterton: A woman, aged 38, who had the inner canthi, caruncles, and innermost extremity of the lower palpebral conjunctivae discolored and of a dark grey appearance. As far as she knew this appearance had always been present. She had never had her lids treated with anything, neither had she any sign of old disease. Her occupation consisted of filling toy crackers with fulminate of silver, and she had done this work for years. Mr. Chatterton suggested that the silver salt had got into the eye and had caused the discoloration shown.—Mr. Charles Blair: A case of retinitis proliferans in a woman aged 59. The vision of the left eye was suddenly lost six months ago. The right fundus showed changes suggestive of albuminuria with numerous retinal hæmorrhages. The urine was, however, free from both albumen and sugar.—Mr. A. Ogilvy: Case of pemphigus of the conjunctiva in a farm laborer, who for failing health went to Canada. Shortly after getting there he suffered from pemphigus, the attack lasting for six weeks. He remained well for six weeks, and then returned to Eng-

land, at which time he could see to read with ease. On the passage home he had another attack, which was very severe. The eyes got rapidly worse, and now the corneæ were seen to be opaque, and the conjunctiva was so shrunken that but a little sac remained and the entropion was most troublesome. Lanoline applied to the eyes gave great relief.—Messrs. Lawson and Parsons: A drawing of a case of sarcoma of the choroid which occurred in a man aged 34. He had had a squint for two years, and the sight of the right eye had been failing for a year, and when first seen it was almost blind. For three months a black swelling had been present on the sclerotic, and this was increasing rapidly in size, and had much the appearance of a staphyloma. The eye was blind and the lens was opaque. The eye was removed, and on section a large sarcoma was found, which was thin and flat, and not at all like the choroidal sarcoma that is commonly seen.—Mr. Halliburton McMullen: A child aged 9 months, in whom an occasional upward deviation of the eye had been noticed since birth. On examination it was found that there was complete absence of downward rotation of the right eye, the movements in other directions were normal. On looking downwards the left eye fixed, while the right eye was rotated upwards and outwards, and was slightly retracted; the eyelid at the same time became elevated and retracted. The inferior rectus, and possibly also the superior oblique, were defective.—Mr. R. E. Bickerton: Changes in the optic disc, retina, and choroid in a patient aged 15. When first seen in July last he had a well-marked neuritis in the right eye, with surrounding retinitis. The disc, when shown, was raised, and of a bluish-white color, with a wool-like margin. There were also numerous fundus changes.—Mr. Charles Wray: A man who had improved considerably while under the treatment for tobacco amblyopia which he described at the last meeting of the Society. It consisted briefly in making such patients take brisk walks and drink large quantities of water.—(*Brit. Med. Jour.*)

## ABSTRACTS FROM MEDICAL LITERATURE.

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BY W. A. SHOEMAKER, M.D.

ST. LOUIS, MO.

## THE NEW OPHTHALMOLOGY AND ITS RELATION TO GENERAL MEDICINE, BIOLOGY AND SOCIOLOGY.

George M. Gould (*Jr. Am. Med. Ass.*, Nov. 19, 26), discussing this subject at length, points out that while the "old ophthalmology" was mostly concerned with the operations on and inflammations of the eye and with the ocular results of systemic disease, the "new ophthalmology," taking account of these things also, is, however, particularly interested in the effects on the general system of *eyestrain* caused by the use, particularly for near work, of eyes that are not entirely normal optically.

The small variation of  $\frac{1}{300}$  of an inch in the measurements of the eyeball, or a slight unequal curvature of the cornea may be sufficient to handicap the individual in the struggle for some occupations, or may cause him to be a great sufferer.

It does not always do this, the simple law, however, being that the greater the ametropia the more limited the range and choice of occupations, while the lower errors of refraction cause pain and illness.

Eyestrain being only functional, its results are, to begin with, at least, the same. Many nervous and psychic troubles, as well as disorders of nutrition, when caused by eyestrain, are at first entirely functional, while some of the more severe diseases which sometimes result, directly or indirectly from eyestrain, have also at first a period of functional disorder, where remedies are effective, preceding the organic, inflammatory and incurable condition.

Gould claims that the scientific correction of ametropia prevents the great majority of eye diseases. The great proportion of ocular diseases are: those of the extrinsic muscles; inflammations of the conjunctiva, cornea, and iris; glaucoma;



high and increasing myopia; cataract; and all of these are frequently caused by ametropia. This one condition, then, is the prolific cause of many eye diseases, and the ophthalmic surgeons and therepeutists have begun to see that prevention is better than cure, and are becoming refractionists.

It is an important truth that each function of the body is dependent on other functions, and the specialist must ever be watching for lines of cause and effect running back and forth between the disease he is treating and those of all other specialties.

As the condition of the eyes affects the physiology of the system, so does physiology pass into pathology and so must pathology merge into biology. Since vision is one of the necessary conditions of self-motility it is evident that all nutrition, safety, attack and defense, free-moving and effectual doing is accomplished by seeing. Thus the evolution of the eye made possible the evolution of the race. In this evolution accuracy of sight is a prime law. The child who can not see accurately becomes, to say the least, a very different man or woman from the one who has good vision. Such are the backward scholars in school, who in a large part are the failures in life, and society's expensive degenerates, defectives, and dependents. They increase with every step of civilization, because each such step means the difficulty of added near vision.

#### A SIMPLE OPERATION FOR SENILE ENTROPION.

Clark W. Hawley (*Jr. Am. Med. Ass.*, Oct. 15) describes a simple operation for senile entropion, where you have to deal with the entire folding in of the lid and not with the contraction of the cartilage.

He threads a heavy piece of silk with two needles; then, clamping the lid, injects a few drops of 4 per cent. cocain into the skin: removing the clamp, he inserts one needle just below the margin of the lid, about the center, and carries it down and outward slightly and as close to the cartilage as possible, catching up the periosteum on the margin of the orbit and brings it out on the skin. The other needle is inserted about three millimeters distant from the first entrance and carried down parallel to the first thread, passing through

the periosteum and coming out near the exit of the first. The two ends are tied over a piece of cotton with sufficient tension to retain the lid in position, and allowed to remain so for two days, when the loop is fished out from the skin, and every day the threads are drawn back and forth. At the end of two weeks a heavy band of cicatricial tissue is formed, when the threads are removed, the lid being held firmly in position.

No claim is made for originality.

#### INTRAOCULAR HAEMORRHAGE.

A. H. Griffith (*British Med. Jr.*, Nov. 12) says that primary intraocular haemorrhage may occur from the following general conditions: 1. Blood changes. Infective endocarditis, pyaemia, septicaemia, purpura, scorbutus, and pernicious anaemia. Other toxic conditions, as phosphorus poisoning and parasitic blood affections. 2. Diseased state of finer bloodvessels. 3. Back pressure of cardiac disease. 4. Embolic processes and thromboses. The author has never seen spontaneous haemorrhage into the anterior chamber of the eye. In 6,500 consecutive eye cases there were only 33 cases of spontaneous haemorrhage—0.5 per cent.

#### INVESTIGATION ON THE COMPARATIVE VISUAL ACUITY OF SAVAGE AND CIVILIZED PEOPLE.

W. H. Rivers (*British Med. Jr.*, Nov. 12), after examining a large number of people of all nationalities and tribes, has come to the conclusion, apart from errors of refraction, that man everywhere has practically the same amount of vision, and that in instances in which savages appear to possess greater visual acuity than white men, it is entirely due to practice and education, and to their being familiar with their surroundings.

#### HAAB'S GIANT MAGNET THE BEST MEANS TO EXTRACT FROM THE VITREOUS STEEL OR IRON WHICH ENTERED THROUGH THE CORNEA.

N. J. Weill (*Annals of Ophthalmology*, Oct.) cites a few examples illustrating the ease with which the Haab magnet attracts, from the vitreous into the anterior chamber,

splinters of steel or iron, without injury to the crystalline lens. He says there is no danger of the magnet attracting too forcibly, since the strength of the magnet can be regulated with a rheostatic arrangement. In all cases the pupil should be dilated to its maximum in order that the iris shall not interfere with the passage of the splinter into or from the anterior chamber. When the steel is anterior to the vitreous the corneal route is the natural one for its extraction and, if possible, this should be accomplished without the entry of any portion of the instrument into the anterior chamber.

In those cases where the splinter enters the vitreous via the sclera, in which there is promise of some vision, it should invariably be extracted with the giant magnet, around the lens and through the cornea. In the first case cited a small pyramidal splinter pierced the cornea and iris without injury to the lens and lodged in the vitreous from whence it was extracted five days later. The giant magnet guided it forward around the lens, where it caught in the pupillary portion of the iris, although the pupil was dilated ad maximum. An iridectomy was done and the splinter extracted. In a second case an exceedingly small splinter, which had penetrated the crystalline lens and had lodged in the vitreous, was extracted two days after the injury. The vision in both cases is improving.

#### HEREDITY AND TREATMENT OF SQUINT.

Cohn (*Berliner Klinische Wochenschrift*) tabulates the statistics gleaned from his personal experience in respect to the heredity of squint. The more he inquired the larger the proportion of squint in the family history. Out of 27,000 patients he found 805 with squint and there was a history of squint among the relatives in 16 per cent. of the first series, 25 per cent. in the second, and 33 per cent. in the last. The various relatives were parents in 25 per cent., grandparents in 7 per cent., brothers or sisters in 26 per cent., and uncles or aunts in 12 per cent., a total of 172 relatives with convergent squint to 805 patients with the same. Worth's statistics show 52 per cent. heredity and Jensen's 70 per cent. In all Cohn's hereditary cases the squinting eye exhibited hyperopia, which he cites as a significant fact. He thinks



there is probably some unknown factor at work here, possibly a congenital alteration in the internus, which ophthalmologists will do well to seek. We are not positive even as to whether amblyopia is cause or effect of the squint. In regard to treatment he follows the following principles: 1, up to the fourth year he has the sound eye bandaged for a few hours every day while the child is at play; 2, during the fifth year he commences special exercises with convex glasses and the stereoscope; 3, corrects total hyperopia; 4, refrains from operating until the child is 10 years old, and does tenotomy in the sixth year only in case of great disfigurement; he promises improvement but not total cure, and advances the externus in extreme degrees of squint.—(*Jr. Am. Med. Ass.*)

#### ALLEGED LOSS OF VISUAL POWER IN SCHOOL CHILDREN.

R. A. Katz (*Roussky Vrach*, Oct. 6) maintains that the nervous irritability and the depression which overstudy, especially before examinations, produces in school children, may give rise to a neurasthenic condition in which loss of vision is the effect of auto-suggestion. He reports that of 623 children of school age whom he had examined 2.89 per cent. had defects of vision which were the results of auto-suggestion or malingering, having no real visual defect. The great majority were girls and there were only two boys among the eighteen cases reported. This shows the difference between the resistance of the nervous systems of the boy and the girl. It is difficult to say in how many of these cases the defect of vision is caused by autosuggestion, and in how many others it is simply a result of malingering. In a few of these cases there was simply malingering with the desire of obtaining glasses, or simply of exciting sympathy. In some of the cases also, both malingering and autosuggestion played a role.

The treatment of these cases should consist of the removal of the cause of autosuggestion, if this can be found. Sometimes foreign bodies in the eye, or other causes of irritation, induce the impression of diminished vision in school children.

A CASE OF CONGLOMERATE TUBERCLE OF THE CHOROID.

T. R. Pooley (*Med. Record*, Nov. 26) reports a case of conglomerate tubercle of the choroid, with extension into the sclera and retina, and secondary glaucoma.

The patient was a man, aged twenty-six, all of whose brothers and sisters had died of pulmonary tuberculosis. He had suffered from pain and redness in one eye for a year, and for some time the condition was treated as a possible syphilitic process. When seen by the author the eye presented the usual symptoms of absolute glaucoma and there was no ophthalmoscopic reflex. The other eye was normal. The eye was enucleated the same day and the patient's recovery was uneventful. Microscopical examination showed that the process was well advanced and tubercle bacilli could be demonstrated in stained sections. Now, one year after operation, the patient is in good health and there is no evidence of any pulmonary involvement.

A CLINICAL AND STATISTICAL STUDY OF CONVERGENT STRABISMUS.

Wendell Reber (*N. Y. Med. Jr.*, Nov. 5) concludes his article on this subject by offering the following tentative propositions as the result of his experience with esotropia:

1. Esotropia is most likely to manifest itself before the end of the third year.

2. It cannot yet be said whether any of the various reasons assigned by parents for the appearance of strabismus have aught whatever to do with it. Whooping cough may be related to it.

3. Heredity certainly plays a part in bestowing upon some children a congenitally deficient visual apparatus.

4. The degree of deviation will average about 30° in a large number of cases. It is in no special way bound up with the degree of refractive error.

5. The amblyopia of esotropia is presumably an amblyopia ex anopsia, the present day evidence being against Schweigger's theory of a congenital amblyopia.

6. The degree of amblyopia increases with the length of time elapsing between the appearance and the time of treatment; especially is this true after the seventh year.

7. Improvement may be expected in the amblyopic eye in fifty to sixty per cent. of cases by properly adjusted glasses. This improvement varies from twenty per cent. to ninefold betterment.

8. While a defectively developed fusion apparatus has much to do with the genesis of esotropia, the influence of hypermetropia and its allied states seems almost as important as in the days of Donders. The part played by astigmatism is no little one.

9. There seems to be no special relation between the degree of refractive error and the degree of deviation.

10. Hypermetropic conditions of from one to four dioptries seem most commonly associated with esotropia.

11. A very high degree of hypermetropia does not necessarily exclude strabismus, as three cases in the series here presented were of 11 D. and over.

12. If taken before the fifth year, there seems no reason why the strabismus should not be cured by non-operative methods in seventy per cent. of cases. This percentage will, in all probability, be increased to eighty per cent. in the next ten years.

13. The results of non-operative treatment in children, if adhered to with any persistence, are infinitely better than any "scissors" statistics thus far offered.

#### NON-OPERATIVE TREATMENT OF TRACHOMA.

Frank Judson Parker (*Med. Record*, Sept. 17th) sums up his advice for the treatment of trachoma as follows: Surgical treatment should be advised only in those cases in which frog's spawn granulations are present. It should always be followed by after treatment. Operation should not be performed in cases in which the hard, deep seated granulations are present on account of the injury done to the conjunctiva in removing them. The habits and general condition of the patient are very important features to consider in preventing spread and effecting cure. The non-operative treatment is bichloride rubbing, with the use of one of the organic silver solutions night and morning. In the hard variety, the use of copper sulphate and the silver solution.



## AMERICAN OPHTHALMOLOGICAL SOCIETY

The forty-first Annual Meeting of the American Ophthalmological Society was held this year on Thursday and Friday, the 11th and 12th of May at the Boston Medical Library, Boston, Mass. The following papers were read:

(1) A case of flat melano-sarcoma of the choroid, with unusual clinical features. DR. C. J. KIPP.

(2) Concerning melanoma of the choroid, with the report of two cases. DRS. G. E. DE SCHWEINITZ and E. A. SHUMWAY.

(3) Metastatic carcinoma of the ciliary body. DR. C. W. CUTLER.

(4) The treatment of inoperable cases of malignant diseases of the orbit by the X-ray method. DR. C. S. BULL.

(5) The Sachs lamp for transillumination of the eye. DR. E. S. THOMSON.

(6) Remarks on the use of the Roentgen rays in localizing foreign bodies in the eyeball and orbit. DR. J. E. WEEKS.

(7) Improved surgical methods for the successful use of the electro-magnet. DR. R. SATTLER.

(8) The attractive power of the magnet upon steel alloyed with other metals. DR. W. M. SWEET.

(9) What are the so-called reflexes which can be properly referred to eye-strain? DR. L. HOWE.

(10) Regulation of treatment of conjunctival diseases by systematic bacteriologic study. DR. C. A. OLIVER.

(11) Symptoms presented by the different bacteriological types of acute conjunctivitis. DR. ALEXANDER DUANE.

(12) Relapsing iritis. DR. H. WOODS.

(13) Juvenile glaucoma. DR. R. SATTLER.

(14) A case of homonymous, left-sided, inferior tetartanopsia following toxic dose of salicylate of soda. DR. J. H. CLAIBORNE.

(15) Cyanosis retinae. DR. W. C. POSEY.

(16) Acquired cyst of conjunctiva containing an embryonic tooth-like structure. DR. E. STIEREN.

(17) Variations in the facility of monocular lid-closure and the cause thereof. DR. W. RIDER.

(18) A case of strabismus convergens concomitans, with suppression of the image of the better (habitually non-squinting) eye. DR. D. W. HUNTER.

(19) A case of cystic sarcoma of the orbit—extirpation—recovery. DR. H. F. HANSELL.

(20) Certain congenital affections of the eye, coinciding with strong ante-natal impressions made on the mother. DR. H. DERBY.

(21) Lesions of the fundus of the eye due to ptomaine poisoning. DR. C. S. BULL.

(22) Zonular cataract with irideremia; extraction of the lens, which had become entirely opaque, in the capsule—microscopical examination. DR. F. N. LEWIS.

(23) Value of the so-called high-frequency current in certain ocular conditions, with illustrative cases (preliminary report). DR. J. C. LESTER.

(24) A case of discoloration of the cornea by blood-pigment, and one of hæmorrhage into the cornea. DR. O. F. WADSWORTH.

(25) A case of epithelial corneal cyst, with microscopic and macroscopic specimens. DR. J. H. CLAIBORNE.

(26) Tumors of the conjunctiva and cornea. DR. J. M. RAY.

(27) Vernal conjunctivitis in the Negro. DR. DUNBAR ROY.

(28) Photophobia. DR. P. FRIDENBERG.

(29) A new test-type case. DR. C. H. WILLIAMS.

(30) Some changes in the construction of eye instruments which have not been in the direction of improvement. DR. S. THEOBALD.

(31) The pupils in dementia paralytica. DR. WARD A. HOLDEN.

# THE AMERICAN JOURNAL OF OPHTHALMOLOGY.

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## ORIGINAL ARTICLES.

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### TWO CASES OF RETRO-BULBAR NEURITIS.

BY JULIUS H. GROSS, M.D.,

ST. LOUIS, MO.

*Case No. 1.*—E. R., age 45, male, bookkeeper, Nov. 19, 1903, makes the following statement:

About 5 days ago V. O. D. failed suddenly, while working in the cellar of his residence, on a Sunday morning. He had been stooping and when he straightened up he noticed that he could not see well with O. D.

**PERSONAL HABITS.**—Smokes tobacco, 3 cigars daily; but stopped smoking 1 week ago, because he thought it was disagreeing with him, drinks strong coffee three times a day, alcoholic drinks in great moderation, no history of lues.

**GENERAL APPEARANCE OF PATIENT.**—Man of good size and portly, has appearance of a good liver, external appearance of eyes normal, papillary reflexes normal, refraction O. D. with + 1.25 D. sph. V. = 15/48, O. S. with + 1.25 D. sph. V. = 15/15, see fields taken 2 days later.

Ophthalmoscope gives O. D. disc rather pale, the retina may possibly not be as clear as it should be, it is slightly



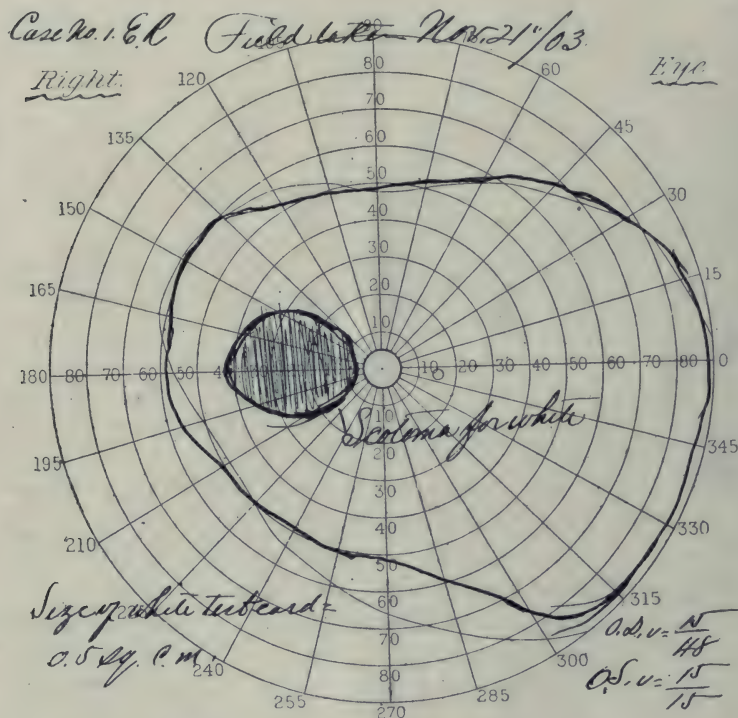
"watery," otherwise it is normal, veins slightly tortuous—well filled, O. S. normal.

I ordered him to stop use of tobacco and to take tablets  $\text{Hg}_2$ .  $\text{Cl}_2$ . gr.  $1/5$ —one every three hours.

Nov. 21, O. D. V. =  $15/48$ , O. S. V. =  $15/15$ .

Take sat. sol. K. I. gtt. viij. t. i. d.

Nov. 23, O. D. V. =  $15/24$ , O. S. V. =  $15/15$ , distinguishes red from green test card 0.5 sq. cm. by central vision readily O. S., but not O. D.



Dec. 2, O. D. V. =  $15/24$  to  $15/19$ , O. S. V. =  $15/15$ , continue K. I. gtt. xij. t. i. d.

Dec. 22, O. D. V. =  $15/19$ , O. S. V. =  $15/15$ , patient is no longer conscious of the scotoma, but complains of objects appearing as if seen through a fog ("steam rising from kettle"), O. D. and O. S., continue K. I. gtt. xvij. t. i. d.

Dec. 29, Vision the same ( $15/19$  and  $15/15$ ), see field which is almost normal, except for a small scotoma around the blind spot.

Jan. 5, 1904.—No longer sees objects as if in a fog, O. D. V. = 15/19, O. S. V. = 15/15.

March 29, 1904, O. D. V. = 15/12, O. S. V. 15/12.

Continue K. I. gtt. xl. t. i. d.

June 8, O. D. V. = 15/15 to 15/12, O. S. V. = 15/19.

Accommodation of O. D. weaker than that of O. S.

Continue K. I. gtt. x. t. i. d.

June 17, Vision remained the same, but pupil O. D. does not react as well to light as O. S. Patient tells me that he



drinks six cups of strong coffee daily, advised to diminish the quantity of coffee. Continue K. I. gtt. xv. t. i. d.

Aug. 3, 1904, O. D. V. = 15/12, O. S. V. = 15/19, accommodation O. D. again noticed to be weaker than O. S.

Aug. 16, O. D. V. = 15/12, O. S. V. 15/15.

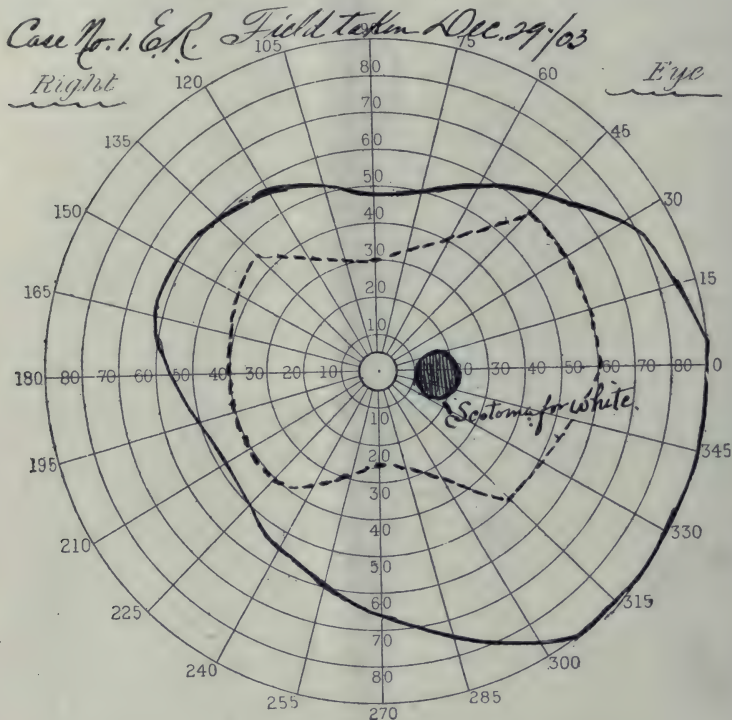
Has his annual hay fever attack.

Feb. 8, 1905, O. D. V. = 15/12, O. S. V. = 15/15.

Taking sat. sol. K. I. gtt. xx. t. i. d.

March 1, O. D. V. = 15/12, O. S. V. = 15/15 to 15/12.

As is shown by the visual result the patient had now recovered the V. in O. D., and only a slight weakness of the accommodation remained.



Ophthalmoscope gives: Absence of the smaller vessels on discs and slight paleness on the temporal sides. Pulse of about 75 and rather hard. Repeated examination of the urine during the period of treatment showed absence of albumen and sugar.

*Case No. 2.*—H. S., male, age 27 years, barber, on April 25, 1902, makes the following statement:

Twelve days ago O. S. got red and blood-shot, 8 days later (i. e. four days ago) he noticed that he could not see well with O. S.

**PERSONAL HABITS.**—Chews and smokes tobacco moderately, drinks one or two glasses of beer daily and occasionally a little whiskey, never had venereal disease, does not appear well nourished, seems dull, even stupid, intelligence very limited, without cor. O. D. V. = 15/12, O. S. V. = counts



fingers at 3 feet excentrically, field O. S. appears to be good, refraction emmetropic or nearly so, has difficulty in telling the color of red and green by central vision; but matches colored pencils readily O. D. and O. S., external appearance of eyes normal.

Ophthalmoscope gives: discs pale O. D. and O. S., temporal side of disc O. D., has a narrow ring of pigment extending almost half way around the disc, diagnosis—retro-bulbar neuritis O. S., bichloride of mercury 1 to 120 solution was prescribed in doses of eight drops t. i. d., discontinue use of tobacco and alcoholic drinks.

April 29, O. D. V. = 15/12, O. S. V. 3/60, ophthalmoscope gives: no change.

May 13, O. D. V. = 15/12, O. S. V. = 3/24 or 15/192.

May 23, O. D. V. = 15/9, O. S. V. = 15/75 to 15/60.

Ophthalmoscope gives: O. S. disc very pale, the field taken this day appears normal.

June 3, O. D. V. = 15/9, O. S. V. = 15/38 to 15/30, still finds it difficult to tell red from green by central vision; but field for white and red is good.

June 16, O. D. V. = 15/9, O. S. V. = 15/30 to 15/24.

Oct. 13, 1902, O. D. V. = 15/9, O. S. V. = 15/15, the dose of bichloride was reduced to gtt. v. t. i. d. and sol. K. I. (saturated) gtt. x. t. i. d. added.

Nov. 3, O. D. V. = 15/9, O. S. V. = 15/12.

Nov. 24, Vision as on previous date and the field, as the chart shows, is about normal.

Dec. 8, O. D. V. = 15/12, O. S. V. = 15/48.

Ophthalmoscope gives: no cause for failure in vision, except that the vessels (O. S.) are somewhat smaller than those of O. D. The doses of bichloride sol. were increased and the K. I. sol. was temporarily discontinued.

Jan. 5. 1903, O. D. V. = 15/12, O. S. V. 15/19.

Ophthalmoscope gives: O. S. the nasal side of disc illy defined.

Jan. 19, O. D. V. = 15/9, O. S. V. = 15/75 to 15/60.

Ophthalmoscope gives: O. D. no change, O. S. Muddy Vitreous. Posterior portion of vitreous filled with small fine particles, optic disc seems swollen, used a small drop of atropia  $\frac{1}{120}$  sol. O. S. continue bichloride sol.  $\frac{1}{120}$  gtt. xvi. t. i. d.

Feb. 9, Ophthalmoscope gives: Floating membrane in vitreous anterior to other opacities, O. S. V. = 15/9, O. S. V. = 15/19.

During these relapses the vitreous would be more or less cloudy corresponding to the vision.

March 9, 1903, O. D. V. = 15/9, O. S. V. = 15/24.

At this time patient is taking gtt. xviii. sol. bichloride  $\frac{1}{120}$  three times a day, which is equal to about  $\frac{1}{7}$  gr. of bichloride t. i. d. This dose was beginning to salivate and had to be reduced to gtt. x. t. i. d.

Sept. 28, O. D. V. = 15/9, O. S. V. = 15/48.

Ophthalmoscope gives: O. S. vitreous muddy. Outlines of disc slightly hazy, the retinal pigmentation in both fundi somewhat blotchy.

Dec. 25, 1903, O. D. V. = 15/9, O. S. V. = 15/48 to 15/38, now has an oval scotoma of  $45^\circ$  in length in the lower temporal quadrant of field, extending almost to the region of central vision (O. S.).

Ophthalmoscope gives: no change.

May 16, O. D. V. = 15/9, O. S. V. = 15/192, increase sol. bichloride to gtt. xviii. t. i. d.

June 13, 1904, O. D. V. = 15/9, O. S. V. = 15/30, improved.

June 27, Again fell to O. D. V. = 15/12 + O. S. V. = 15/120 to 15/75.

Ophthalmoscope gives: Vitreous cloudy and artery seems smaller than usual. Thinking there might be a nervous element in the sudden and frequent changes of the vision and that the diminished size of the artery might be due to an arterial spasm; I allowed him to inhale a pearl of amyl nitrate—result negative, continue Hg. Cl<sub>2</sub>.  $\frac{1}{120}$  gtt. xviii. t. i. d., K. I. gtt. xv. n. m.

July 18, O. D. V. = 15/9, O. S. V. = 15/24.

Oct. 13, Vision O. S. again fell to 15/96.

Ophthalmoscope gives: O. S. vitreous again cloudier and papilla seems swollen.

Dec. 8, 1904, Vision again fell to O. D. 15/9, O. S. V. = 15/60, Hg. Cl<sub>2</sub>.  $\frac{1}{120}$  gtt. xv. t. i. d. and Burnham's sol. iodine gtt. xv. t. i. d., this dose was later increased to gtt. xxv. t. i. d.

Jan. 19, 1905. O. D. V. = 15/9, O. S. V. = 15/38, pupil O. S. perceptibly larger than O. D., reactions sluggish, O. S. unusually sensitive to light.

Feb. 27, Dr. Nobbe saw patient with me O. D. V. = 15/9, O. S. V. = 15/96, ophthalmoscope gives: O. S. posterior part of vitreous filled with small floating opacities—also a floating membrane already mentioned, which seems anterior to the other opacities. Arteries and veins small, but the arteries smaller, in comparison, to the veins, disc pale, pupil O. S., reacts slowly, it reacts better in a reflex way than by direct stimulation, by light, knee-jerk, (patellar reflex) exaggerated.

Mar. 7, 1905, O. D. V. = 15/9, O. S. V. = 15/48 + still has a central scotoma, for white and red, O. S., pupil O. S. is smaller than O. D. and reacts to light only by indirect stimulation, there is no paresis of accommodation, knee-jerks exaggerated. During the period of almost 3 years he had 12 relapses.

Now acknowledges that he acquired syphilis one year before the eye trouble came on, examinations of the urine in both cases were made; the results were negative.

#### CONCLUSIONS.

Both of these cases somewhat resemble cases of tobacco amblyopia.

While the first case might be diagnosed as a retro-bulbar neuritis, I am inclined to think that it was a retro-bulbar hæmorrhage.

The change in the position of the scotoma, the rapid diminution of its size, the rapid recovery and the general aspect of the case lead me to this conclusion.

While the 2nd case could in the beginning only be diagnosed as a retro-bulbar neuritis, when the vitreous became hazy and the papilla swollen, the diagnosis had to be changed to: Neuro-retinitis, accompanied by hyalitis.

The cause of which was acknowledged by the patient to be lues, after two and a half years of treatment which gave him the benefit of the doubt.



## A CASE OF ALBUMENURIC IRIDOCYCLITIS.

BY N. M. SEMPLE, A.M., M.D.,

ST. LOUIS, MO.

SINCE the first classical report of Leber<sup>1</sup> in 1885 of what he considered as an iritis albumenurica, there has appeared in the literature very little definite upon this subject. Yet, from the few cases reported, and from the analogy of iritis in other forms of constitutional disease, e. g., diabetes mellitus, it seems justifiable to consider a possible ætiological relation between iritis and albumenurica. And the report of any case that might throw possible light upon the subject is worthy of consideration. This is my excuse for the following report, in which, unfortunately, there exists a lack of many points of scientific accuracy especially that of post-mortem pathological findings.

The following is the clinical history:

J. H. D., male, single, age 28 years, conductor on street railway.

Family history: Good as far as obtainable.

Past history: When nine years old patient had chicken-pox—has suffered from three or four attacks of malarial fever. 8 years ago had gonorrhea followed by involvement of joints. Six years had what attending physician pronounced syphilis, anti-syphilitic treatment being immediately begun, as to the nature and extent of which definite report could not be obtained. During the past three years the patient has noticed intermittent periods of increased frequency of urination, which he attributed to the more or less constant standing and jolting necessitated by his work—that of a conductor. During the past few months he has had to pass urine in good quantities 2 to 3 times during the sleeping period of 8 to 9 hours, otherwise he has suffered no inconvenience whatever.

Patient first reported to me August 11, 1904, with the

history of having gotten the day before glass into left eye from a broken window pane. On examination no glass could be found, a slight cut of the scleral conjunctiva could be made out near the outer limbus. There was present considerable conjunctivitis with slight œdema of the lower lid. The following day the œdema of the lid had markedly increased, the conjunctiva scleræ became œdematous, and in a short time symptoms of a severe iritis developed—ciliary injection, swollen, muddy iris, decided pain and intense photophobia. Later the aqueous became cloudy, and extensive deposits appeared on the posterior surface of the cornea, indicating involvement of the ciliary body.

On account of the suggestive history of syphilis of six years previous, the patient was put upon anti-syphilitic treatment, the iodide of potassium being rapidly pushed to the extreme of tolerance. The iris responded very sluggishly to the energetic use of atropia. The globe became very sensitive, and the œdema of lids and conjunctiva scleræ became very marked, the patient suffering intensely. On Sept 26 (three weeks after the onset of the disease) there appeared hæmorrhages from the iris. This first attack lasted until Oct. 17th, when the patient returned to work, still reporting for observation. At that time the ophthalmoscope showed the fundus normal. V. 20/15 = no injection of the eyeball.

On Nov. 8 occurred a relapse of even greater severity than the first attack.

On account of the indefinite history of syphilis, and the lack of response to the specific treatment which had been kept up vigorously, and on account of the possible irritant effect of the prolonged use of the iodide, the patient was taken from the anti-luetic treatment, for which was substituted aspirin, which seemed to best control the pain. The second attack continued with more or less severity, and a hæmorrhagic tendency, for about six weeks, the patient returning to work on Dec. 27th, the eye apparently normal.

About a month later, February 1st, patient again returned with signs of a beginning relapse.

On making a more thorough general examination of the patient than was made during the first attacks, at which time

a syphilitic aetiology was assumed, a careful examination of the urine was made. Here I should like to emphasize the importance of such a routine examination, especially for the physician doing special work, who is very apt to neglect the importance of the general examination of the patient.

The first analysis of the urine (made at the beginning of third attack) gave the following result:

Color, muddy yellow, excess of sediment of urates, reaction slightly acid, specific gravity 1033, quantity in 24 hours, 82 oz.

Albumen one tenth per cent., no sugar. Microscopical examination showed fairly large number of hyaline-granular casts with an occasional epithelial cast. There were no symptoms of general systemic involvement, except the complaint of the patient of occasional shortness of breath on exertion. Unfortunately the report of the heart examination made at the time is not at hand.

The patient was immediately put upon a vigorous diet, consisting chiefly of milk and vegetables, and at first the free use of saline purgatives, later replaced by the mild aperient waters.

There was an immediate improvement in both the iritis, and the condition of the urine. The latter at the end of a month had regained its normal clear straw color, Sp. Gr. 1020, only occasional trace of albumen, and hyaline or granular casts could be demonstrated with difficulty. At this time patient could sleep 8 to 9 hours without the necessity of voiding his urine. The iris responded especially promptly, the iritis never approaching the severity of the two former attacks. There was no œdema of the lids or scleral conjunctiva. The pupil was fully dilated by the atropia, and the patient suffered practically no pain. The eye was kept under the influence of atropia for about a month on account of a slight but persistent injection. Since this attack the patient has been under constant observation for about four months, during which time there has been no tendency to relapse, the eye remaining normal, V. = 20/15.

In reviewing the history of the above case, there are a number of points that would seem to justify the conclusion that there existed an aetiological relation between the iritis and



the albumenuria. There can hardly be a doubt but that the patient was suffering from an albumenuria, that there were organic changes in the kidney—albeit of slight character. The fact, that, when first examined, the urine showed a slight increase of quantity, a rather high specific gravity, albumen, and hyaline-granular casts in fairly large numbers, and the fact that the condition was at least temporarily greatly improved by proper attention to diet, etc., would lead us to think that we had to do with a chronic nephritis, whether interstitial or diffuse, it would be difficult to say, but which had not advanced so far but that it was at least temporarily amenable to treatment. That the iritis was of the same ætiology seems strongly to be inferred by the nature of the attacks, and their response, or lack of response, to treatment. The first attacks showed absolutely no response to the specific treatment of syphilis, while the third attack responded immediately, when the treatment was directed towards the albumenuria. Nor has there so far been a tendency to relapse.

The lack of symptoms indicating the invasion of other organs by the albumenuria would hardly lead one to doubt its existence, nor would the rapid and marked improvement of the urine on strict attention to diet, etc., necessarily mean that we had to do merely with a transient accidental albumenuria. The improvement in cases of marked general involvement is often decided, and of long duration. In the case cited in this report the iritis was apparently the first sign of trouble, with the exception of the increased frequency of urination, which had not inconvenienced the patient sufficiently to cause him to consult a physician.

But why can not the iris as well as the retina be the seat of the first signs of the general disease? That the involvement of the retina is often the first symptom of albumenuria is a long established fact. Why could not the same individual susceptibility—albeit very rare—be present in the iris, where the circulatory system is also of the finest, and most delicate?

In all the cases that I have been able to find in the literature, the diagnosis of nephritis had been made previous to the patient's coming under the observation of the ophthalmologist. Neither in the case of Leber<sup>1</sup>, nor in the one re-

ported by Schapring<sup>2</sup> was there a post-mortem examination. In the former there was an extensive involvement of the choroid, less so, of the retina. In the case reported by Schapring the retina seemed also to have been involved. In the very peculiar case reported by Pollak<sup>3</sup>, in which the microscopical findings were made by Alt<sup>4</sup>, there seems to have been a septic uveitis, simultaneous with a nephritis caused by staphylococcus pyogenes aureus. The case cited in this report showed no involvement of other membranes of the eye, except that of the iris and ciliary body.

1. Von Graefe's f. Ophth., Vol. XXXI, No. 4, p. 107.
2. Iritis as a Symptom of Bright's Disease. By A. Schapring, Amer. Jour. of Ophth., July, 1893.
3. Ophthalmia albuminurica. By S. Pollak, Amer., Jour. of Ophth., May, 1893.
4. Croupous iridochorioiditis. By Adolf Alt, Amer. Jour. of Ophth., May, 1893.

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#### EDITORIAL NOTICE.

At its first commencement exercises, held in the new magnificent quarters of the Washington University of St. Louis, the university honored itself by conferring the well earned honorary degree of doctor of medicine on its special professor of ophthalmology, Dr. John Green of this city.

We offer our best congratulations.

## MEDICAL SOCIETIES.

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### OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

JOHN TWEEDY, P.R.C.S., President in the Chair.

*Thursday, May 4th, 1905.*

#### CONGENITAL CORNEAL INJURY.

DR. LESLIE BUCHANAN, Glassgow, read notes of two cases illustrating the late effects of birth injury to the cornea, and mentioned that he had recently seen a third. The conditions described closely resembled the lines of opacity seen by Buchanan and Thomson in cases of birth injury, and were in the nature of a refraction opacity which at first sight might be taken for a nebula or passed over altogether. The presence of a high degree of astigmatism in one eye only should, however, give rise to suspicion, and lead to examination of the back of the cornea and of the history.

#### MYOPIC CONUS.

DR. LESLIE BUCHANAN, after demonstrating by a series of lantern slides the changes found histologically in cases of lesion of the choroid, showed that in certain cases of myopic conus there was more than a mere stretching of the choroid, a fibro-cellular formation being found in two cases on the surface of the elastic lamina.

DR. A. H. H. SINCLAIR read a paper on Bjerrum's method of testing the field of vision, especially in relation to the diagnosis of glaucoma. He thought it had several ad-



vantages over the ordinary perimeter, for it could be used to investigate the condition of the field within its full limits, and often demonstrated minor or relative effects within the field of great clinical importance, and undemonstrable by other methods.

#### THE PUPILLARY MEMBRANE.

DR. ARTHUR L. BALLANTYNE described the microscopical condition of the left eye of a fœtus of seven or eight months, in which the pupillary membrane was almost complete, and adherent at one part to the posterior surface of the cornea. The iris was adherent to the cornea in the corresponding situation. The different layers of the cornea were normal, but at the place where the iris and pupillary membrane were adherent the endothelial lining of the anterior chamber was absent, though present elsewhere. The remains of the hyaloid artery and tunica vasculosa were also present. The author attributed the adhesion to an inflammatory process which had led to the destruction of parts of the endothelium of the anterior chamber, and consequently to an intimate adhesion of the walls of the anterior chamber at the affected parts. He had found fourteen cases recorded, and two theories were held to account for it. The one was that the cleavage of the mesoblast into substantia propria of the cornea was incomplete, and resulted in the apparent adhesion of the fully-developed membrane and cornea. The other corresponded to that suggested by the author in explanation of his own case.

#### PULSATING EXOPHTHALMOS.

MR. S. JOHNSON TAYLOR related a case of pulsating exophthalmos in a patient aged 55. The condition came on after the receipt of a blow on the head from a fall four years ago. Proptosis occurred four weeks later, and she suffered severe pain with corneal ulceration, all of which became worse in spite of rest, iodide, etc. Consequently, Mr. Taylor tied the right common carotid about nine weeks after the injury, the operation resulting in a perfect and permanent cure.

A CASE OF PRIMARY INTRADURAL TUMOR OF  
THE OPTIC NERVE.

BY H. PERCY BENNETT, M.B., C.M.,

HONORARY SURGEON, NEW CASTLE-ON-TWYNE EYE INFIRMARY.

The patient in this case, a bright, intelligent boy, aged 11, was first seen by me on November 23rd, 1903.

*History.*—Four months ago the eye was noticed to be prominent. Three months ago it suddenly became much more so (hæmorrhage?), and then gradually went back to the position noted on his admission as an out-patient here. A month ago he noticed that he could not see with the eye.

*State on Examination.*—He had considerable proptosis of the right eye, but otherwise was healthy looking, and complained of no pain; the ocular movements were not at all impaired; there was no perception of light in the eye; ophthalmoscopic examination showed the media to be clear; the disc a trifle pale, no blurring of the edges, and the veins tortuous. No swelling could be felt in the orbit, no pulsation, no bruit. Tension of the eye was normal.

*Diagnosis.*—From the perfect mobility of the eye (the corneal reflex showed no lateral or vertical displacement) and the projection being directly forwards, there could be no doubt that one had to deal with a tumor situated within the muscular cone; and, from the early loss of all sight in the eye, with probably a tumor of the optic nerve.

*Treatment.*—As these tumors are not of a very malignant type I decided to try the effects of a course of treatment with pot. iod.; 5 gr. doses were given t. i. d., and later on 10 gr. doses. After a few weeks of this treatment the proptosis was rather less, but later on the condition became worse, and on March 28th the movements of the eye were somewhat restricted when the patient looked down and in.

*Operation.*—On May 1st the eye was removed with 1.3 cm. of apparently normal nerve attached to it. On inserting a finger into the orbit a large tumor could be felt extending right down into the optic foramen; in order to remove the whole of this mass a small gouge was inserted into the apex of the orbit, and the whole of the tumor was removed with

1 cm. of healthy looking nerve at the posterior end; in fact, the nerve was partly torn away at or very near the chiasma.

REMARKS.—The patient for two days after the operation complained of severe headache. May 13th: Vision of remaining eye = 6/6, but the field of vision was very much diminished to the temporal side, this no doubt being due to the dragging of the nerve at the time of the operation—a result much to be preferred to leaving any affected nerve behind which would ultimately involve the brain. This latter is the danger to guard against. Byers, in his excellent monograph, says “the outlook in general is to be regarded as extremely grave. . . . The danger is not from a recurrence in the direct sense of the term, but from the continual development of the intra-cranial portion of the tumor, which it is impossible to remove at the time of the operation.” I am indebted to Dr. Bolan for a careful examination of the tumor, which he found to consist of an overgrowth of connective tissue of the framework of the nerve, and, therefore, agrees with the views held by Treacher Collins and Devereux Marshall as to the nature of these tumors. The growth was smooth and spindle-shaped, measuring 3.5 cm. long, 1.9 cm. in diameter at widest part, and with a maximum circumference of 6.2 cm. Werner has recently recorded two cases of intradural tumor of the optic nerve, one of them being a typical example of this form of a tumor, which Byers classifies as “fibromatosis.” I last saw the patient on December 7th. He was in good health; vision = 6/6, and the field of vision was slightly larger than when last noted. As showing the rarity of intradural tumors of the optic nerve, this is the only case seen at this infirmary during the last six years, and probably for a very much longer period. About 6,000 new patients are seen in a year. According to Collins and Marshall, only two growths of the optic nerve have been removed at the Moorfields Hospital between 1885 and 1900, whilst during that time 388,000 patients have been treated.—*The British Med. Jour.*



## ABSTRACTS FROM MEDICAL LITERATURE.

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BY W. A. SHOEMAKER, M.D.

ST. LOUIS, MO.

### METASTATIC CANCER OF THE CHOROID.

Bailliant (*Recueil d'Ophthalmologie*, June) reports this case. The patient, a woman 58 years of age, had suffered with an ulcerated cancer of the right breast for three years. In September of 1903 digestive disturbances arose. The treatment, lacto-vegetarian regime and purgatives did not result in any improvement. In the first days of October the patient noted a decided diminution in the clearness of vision in the left eye. The trouble increased slowly but constantly, with slight pain. Two months later paralytic disturbances of the right leg and arm developed. Double miosis was noted. An ophthalmoscopic examination showed a swelling at the lower part of the retina. A diagnosis of metastatic cancer of the choroid was made and the paralytic symptoms explained on the supposition that there was another metastatic focus in the vertebrae. The pain, so slight at first, increased, but enucleation was not proposed on account of the cachectic condition of the patient. Other metastases occurred later and death supervened in January, 1904. There was no autopsy.

### THE NERVOUS SYMPTOMS PRODUCED IN CHILDREN BY UNCORRECTED REFRACTIVE AND MUSCULAR ERRORS.

J. Herbert Claiborne (*Jour. A. M. Ass.*, Dec. 10) says there are three factors in eye-strain which are the result of refractive errors:

1. The accommodation effort which at times degenerates into spasm.

2. The spasm which is the frequent result of the fruitless attempt on the part of the eye to overcome astigmatism or myopia.

3. The mental confusion and psychic perturbation which ensues when an imperfect image persists on the retina.

In closing his paper he gives the following conclusions:

1. Nervous symptoms of a variety of kinds occur as the result of eye-strain.

2. Eye-strain is due to refractive errors, to imbalance of the external ocular muscular system, or, more frequently, to a combination of the two.

3. Of these two, the refractive errors, are by far the more frequent cause.

4. Muscular imbalance alone may cause it.

5. Headache is by far the most common nervous symptom in children, caused by eye-strain.

6. The headache is chronic or induced directly by near work and is generally in the forehead or temples.

7. Migraine or hemicrania, due to eye-strain, is comparatively rare in children.

8. Any nervous symptom in children should arouse the suspicion of ocular defects, either as the direct or contributory cause.

9. The refractive correction should be made under atropin.

10. Muscular defects are secondary to the refractive, and should be corrected only in certain cases.

#### USE OF DIAPHORESIS AND DIAPHORETIC AGENTS IN OPHTHALMIC THERAPEUTICS.

Hiram Woods (*Jour. A. M. Ass.*, Dec. 24) offers these conclusions from his study of this subject:

1. The greatest utility of diaphoretics is in the acute congestive and exudative lesions of the uveal tract.

2. Diaphoretics are useful in retinal detachment produced by exudate from choroidal vessels during the course of acute choroidoretinitis. Judging from reported cases, they are

also useful in the retinal detachment of high myopia. It is doubtful if restoration of function in the detached retina is usual or permanent.

3. Diaphoretics are useful in alcohol-tobacco amblyopia and probably in other forms of toxic blindness.

4. Diaphoretics influence to a slight extent only, if at all, lesions of the cornea and sclera.

5. Diaphoretics are useless in atrophic and cicatricial lesions.

#### ACUTE CONTAGIOUS INFLAMMATIONS OF THE CONJUNCTIVA IN CHILDREN.

John E. Weeks (*Jour. Amer. Med. Assn.*, Dec. 10) discusses the acute contagious ophthalmias to which children are subject. They are caused by the pneumococcus, the Koch-Weeks bacillus, the gonococcus, and the Klebs-Loëffler bacillus. All of these forms are contagious and a safe rule to follow is to isolate all cases of acute conjunctivitis where there is any secretion. Conjunctivitis due to the pneumococcus or to the Klebs-Loeffler bacillus is not likely to be epidemic, probably because these two varieties of germs require a suitable soil for their development. The Koch-Weeks bacillus and the gonococcus, on the other hand, find a suitable soil on all mucous membranes, and the form of conjunctivitis due to the first may become widely epidemic, while that due to the gonococcus is likely to affect many where large numbers are massed together in institutions, unless those affected are segregated.

Clinically, the two kinds due to pneumococcus and the Koch-Weeks bacillus resemble each other; the secretion being mucopurulent. A purulent secretion is a characteristic of a gonococcus infection while the membranous form is usually caused by the Klebs-Loeffler bacillus.

The different varieties of conjunctivitis require different treatment. Hence the importance of knowing which germ is causing the disease. If any uncertainty exists a microscopic examination of the secretions should be made.

The application of cold checks the growth of micro-organisms, but only when the temperature is reduced below the



suitable thermal conditions under which they develop. The pneumococcus and the Klebs-Loeffler bacillus develop between about 55° F. and 110° F., while the Koch-Weeks bacillus and the gonococcus develop between 88° F. and 110° F. Since the temperature of the conjunctiva cannot be reduced much below 92° F. by cold applications, it will be seen that such applications may do good in cases of conjunctivitis due to the Koch-Weeks bacillus or to the gonococcus, while in cases due to the pneumococcus or to the Klebs-Loeffler bacillus they would be of little, if any service.

Weeks recommends solutions of protargol or argyrol in the acute stages, 10 per cent. protargol and 20 per cent. argyrol in pneumococcus or Koch-Weeks infections, and 15 to 20 per cent. protargol and 30 to 40 per cent. argyrol in gonococcus infection. In the subacute stages he prefers a more astringent drug, as nitrate of silver in weak solutions. In cases of diphtheria of the conjunctiva, antitoxin should be used and the eyes kept clean with a boric acid solution.

#### THE DIFFERENTIAL DIAGNOSIS OF EXOPHTHALMOS.

Joseph E. Willetts (*Penn. Med. Jour.*, June) discusses the different conditions which cause exophthalmus and points out the symptoms which differentiate them.

Basedow's or Graves' disease is usually very easy to diagnose. The triad of symptoms which are usually present in this disease makes the condition unmistakable except in the few atypical cases. So far as the eye is concerned, the sympathetic nervous system is the part whose function appears to be disturbed. In consequence of this, we find a dilatation of the vessels in the district supplied by the carotids—a dilatation which is manifest even to the external observation in the pulsation of the carotids.

Dermoid cyst and meningocele or encephalocele might sometimes be confounded. In the orbit a meningocele is usually situated above and to the inner side, its avenue of escape from the cranial cavity being the suture between the ethmoid and frontal bones.

The fact of the rarity of a meningocele or encephalocele is no reason that it must not be taken into consideration in

making a diagnosis of dermoid cyst, which like it, is congenital and may occupy the same site.

The signs which principally distinguish a meningocele from the dermoid cysts are as follows:

1. A meningocele is immovably attached to the bone. Not infrequently you feel with the finger the opening in the bone through which the meningocele communicates with the cranial cavity.

2. A tumor of this kind shows the pulsatory and respiratory oscillations which are communicated to it from the brain.

3. A meningocele can be diminished in size by pressure with the fingers, since their fluid contents are in part pushed back into the cranial cavity. At the same time, symptoms of increased cerebral pressure, like vertigo, nausea, deviation of the eyes, convulsions, etc., may make their appearance.

4. In order to be perfectly certain, an exploratory puncture of the cyst must be made. In doing this, we must proceed under rigid antiseptic precautions, so as not to excite inflammation of the cyst and consequent meningitis. The diagnosis become more difficult, or even impossible, when the communication between the meningocele and the cranial cavity (the subdural space) is obliterated; but then, in this case, removal of the tumor is not associated with danger of any sort.

The external appearances of an orbital aneurism and an orbital cellulitis are sometimes very much alike and need to be differentiated. In aneurism the eye is protruded, the blood-vessels of the conjunctiva and the lids and often the surrounding parts, are dilated. On palpating the tumor, distinct pulsation of the eyeball itself, and of the surrounding parts is felt; and if the ear is applied to it blowing murmurs and a continuous whirring and rumbling sounds are heard. The patient also hears the same sounds. The eye can be pushed into the orbit with the hand.

Compression of the carotid of the same side as the exophthalmos, diminishes both the pulsation and the sounds. The visual power of the eye is in many cases abolished; the oph-

thalmoscope shows optic neuritis and enormous dilatation of the retinal vessels.

The most frequent cause of these complex symptoms is an arteriovenous aneurism, resulting from rupture of the carotid artery into the cavernous sinus. This is most frequently caused by traumatism, and particularly by fracture of the base of the skull.

Another condition that presents the same picture externally, is thrombus of the cavernous sinus.

Here, in addition to symptoms common to orbital cellulitis, we have enormously distended retinal veins, and a doughy œdema in the mastoid region due to the impeded circulation through the emissary vein of Santorinus which empties into the transverse sinus. Thrombosis of the sinus frequently passes over to the other side producing the same complex of symptoms there also, while a bilateral orbital phlegmon would be one of the greatest rarities. Finally, thrombosis of the sinus is associated with very severe cerebral symptoms.

Still another similar condition is panophthalmitis, although in the latter the eye itself is involved. We thus practically have the same clinical appearance in orbital cellulitis, thrombus of the sinus, aneurism, and panophthalmitis. The treatment must be necessarily so opposite in these conditions that their differentiation is most important.

#### EYE SYMPTOMS IN GENERAL DISEASES.

Cyrus S. Merrill (*Albany Med. Annals*, July) says: The relation between eye diseases and certain general diseases is so intimate that not infrequently the eye symptoms are the first indication of the general malady, and the physician who does not appreciate the significance of the former will lose the opportunity of combating the general disease at a time when treatment will be of the most benefit. The ophthalmologist, on the other hand, should recognize that eye symptoms are secondary to and caused by general disease; otherwise he may fail to benefit his patient by restricting himself to local treatment.

By watching the movements of the eyelids we sometimes discover symptoms diagnostic of exophthalmic goiter. In the



conjunctiva look for discoloration, such as is produced in jaundice, and the peculiar tint found in anemia and chlorosis. Inflammation of the subconjunctival tissue and superficial layers of the sclera may indicate rheumatism or syphilis. The spontaneous rupture of conjunctival vessels suggests the possibility of similar accidents occurring in the brain. Ulcers of the conjunctiva are suggestive of tuberculosis. Phlyctenular keratitis suggests improper nourishment, and in children adenoids and inflammation of the nasopharynx. Interstitial keratitis is almost diagnostic of inherited syphilis. In the iris there may be manifestations of rheumatism, syphilis, gonorrhœa, tubercle and sarcoma. A careful study of the reactions of the pupil will afford much assistance in determining many lesions in the nervous system. A haziness of the retina due to œdema and inflammatory exudation, congestion of the optic disc with blurred outlines, tortuosity and enlargement of the retinal vessels, with or without hæmorrhages, is the picture of retinitis and generally suggestive of nephritis or syphilis. The choked disc picture is diagnostic of brain tumor. It is evident, therefore, that careful examination of the eye and the accessory structures is of vast importance in many general diseases and should never be omitted.

AFFECTIONS OF THE EYE ASSOCIATED WITH DISEASE OF THE  
CONTIGUOUS SINUSES.

S. D. Risley (*Penn. Med. Jr.*, June) emphasizes the important relation which often exists between certain forms of serious eye disease and the inflammations of the lining membranes of the bony sinuses of the anterior portion of the skull, three of which, the maxillary antrum, the frontal and ethmoid sinuses have a portion of their walls entering into the formation of the bony orbit. There is thus a very thin partition of bone between the tissues of the orbit and the mucous lining of these cavities all of which communicate with the nasal chambers and are susceptible to the catarrhal diseases affecting the nasal membrane.

He gives illustrative clinical examples to demonstrate the liability of extension of disease from these sinuses, either directly through the thin bony partition, setting up a periosti-

tis on the hither side, or by way of the bloodvessels or lymph channels, causing severe asthenopia and even congestion and inflammation of the uveal tract.

He believes that, too frequently, many of the cases of asthenopia ascribed to eyestrain from some insignificant error of refraction or abnormality of muscular balance may be due to a chronic and unrecognized sinusitis, or a blocking or partial closure of the exit for the normal secretions of a contiguous sinus by abnormal states of the nasal passages.

#### THE AETIOLOGY OF ANNULAR KERATITIS.

Adamink (*Roussky Vrach*, June 19) reports a case of annular keratitis in a man aged 66 years, in which the diphtheria bacillus was the cause of the lesion. The patient appeared with a purulent discharge in both eyes, and in the left eye an annular keratitis was found.

There was, in addition, an old trachoma in the cicatrizing stage, and a fistula of the lacrimal sac of the right eye, through which a quantity of pus could be pressed.

The keratitis gradually increased and ulcers of the cornea appeared in the right eye. The diphtheria bacillus was found in the secretion of both eyes. Injections of antitoxine were given, and the usual local treatment was pursued, with the result that the patient rapidly improved, and the bacillus disappeared. Noteworthy features of this case were that there was no diphtheritic lesion of the conjunctiva and that the antitoxine proved to be of much value in the treatment of the local process.—*N. Y. Med. Jr.*

#### TREATMENT OF CERTAIN EXTERNAL DISEASES OF THE EYE BY X-RAYS.

John Green, Jr. (*Interstate Med. Jr.*, June), after giving a brief resume of radiotherapy, as applied to certain external diseases of the eye, draws the following conclusions:

1. In epithelioma and rodent ulcers of the eyelid radiotherapy surpasses all other methods of treatment.

2. In selected cases of trachoma, radiotherapy offers the possibility of rapid cure. The treatment is practically painless and the cure is effected with a minimum of deformity to the lid.

3. The method is worthy of trial in cases of vernal conjunctivitis, tuberculosis of the conjunctiva, orbital sarcoma and carcinoma and in recurrence of glioma after operation for glioma of the retina.

4. The treatment is without danger to the function of sight.

#### THE OPERATIVE TREATMENT OF STRABISMUS.

Wendell Reber (*Penn. Med. Jour.*, June) in discussing this subject, says that a child with strabismus who does not respond to optical and orthopedic treatment should not be subjected to operation until the following considerations have been carefully weighed: 1. Hereditary influence. 2. Refractive status. 3. Degree of deviation. 4. Age. 5. Visual acuity. 6. Status of fusion faculty. 7. Outward swing of visual axis.

In about 50 per cent. of these cases hereditary influence can be traced. The most careful estimation of all refractive errors should be made before thinking of operation. The degree of deviation has much to do with the final decision as to operation. High grade strabismus not influenced by correct glasses calls for surgical interference even in young persons, not under the tenth year; while moderate or low grades are sometimes helped by other treatment. Operation before the tenth year is unadvisable, as the visual axis often changes until puberty. Hence it is wise to wait until the fourteenth year before operating in all but cases with a high degree of deviation— $30^{\circ}$  or over. The importance of the visual acuity to the question of operating is largely bound up with the degree of deviation, the vision generally suffering more where the deviation is high.

The status of the fusion faculty is of great importance, especially before the sixth year, since Worth, as well as others, claims that the faculty is generally as fully developed by



this time as it is ever going to be. This being true, any strabismus persisting after the sixth year should be surgically remedied as soon as possible, but for the fact that during the growth of the child, especially during and just after puberty, the anterior segment of the orbit widens, which increases the divergence of the long axis of the orbit, and also increases the contact arc of the external rectus muscle, which means added efficiency. Hence it is best not to operate before the fourteenth or sixteenth year except where the convergence is more than  $25^{\circ}$  and in these cases at least  $10^{\circ}$  should be allowed to be corrected by facial and orbital growth and changes. For this same reason divergent squint appearing in childhood should be corrected as soon as it is manifested.

The chief operation for the cure of squint are tenotomy, advancement of the tendon, with or without Tenon's capsule, and resection of the tendon, with or without the capsule.

The advantages of tenotomy are that it is simpler, reasonably certain of effect, requires little or no subsequent care, and can be done under cocain. The principal objection to it is that we are never certain of the result. While sometimes we get a brilliant result, at other times we get no perceptible effect or else an excessive effect. At times its effect continues in after years and produces a greater deformity—in the opposite direction—than the original one. On the other hand, while advancement or resection of the opposite tendon or muscle is more difficult to do; we are more certain of the result and usually retain what we get. It has the cosmetic advantage of not causing annoying protrusion of the eyeball, sinking of the caruncle or exposure of the sclera.

For low grade deviations, tendomuscular operations suffice, but for strabismus of  $20^{\circ}$  or more, resection including the conjunctiva and capsule offers the best result.

CONCERNING CERTAIN CASES OF ASTHENOPIA AND EYE-STRAIN  
WHICH ARE INDEPENDENT OF REFRACTIVE ERROR AND  
MUSCULAR IMBALANCE.

George E. de Schweinitz (*Penn. Med. Jour.*, June)  
calls attention to some of the systemic conditions which pro-

duce symptoms very similar to those caused by ametropia and muscular imbalance.

1. Simulation of eye-strain and asthenopia by symptoms dependent upon the lithæmic state.

a—Itching, burning or formication of the eyelid margins.

b—Oedema of the eyelids.

c—Tender spots in the ciliary body with pin-point ocular pains.

These symptoms are so like those produced by errors of refraction that one is often disappointed on examining the eyes carefully not to find some refractive error, or if such is found not to have the symptoms relieved after the error is corrected. Many of these cases are not relieved until after a vigorous dietetic and therapeutic regimen is begun.

2. Foreign body sensation in the eye.

This symptom is often due to an ametropic eye-strain, or one dependent upon an imperfect muscle balance. When not due to this it is most frequently found in neurasthenics or hysterical patients and general regimen is most needed.

3. Subnormal amplitude of accommodation.

First, the subnormal accommodative power, amounting sometimes to paresis of accommodation is at times the first sign of saccharine diabetes. A second class of cases of this character owe their accommodative weakness to toxines other than those created by diabetes. Paralysis of accommodation as well as of the external ocular muscles may be caused by meat and fish poisoning, and de Schweinitz believes that subnormal accommodative power and consequently asthenopia unrelieved by spectacles may be due to various types of intestinal intoxication more frequently than we realize.

#### ADVANCES IN OCULAR THERAPEUTICS.

Henry B. Hollen (*Medical Age*, Detroit, July 10) points out those medicaments which are of especial importance, and which are considered of service in the treatment of ocular disorders.

Adrenalin has been found valuable in many conditions pro-

ducing congestion and exudation, such as conjunctivitis keratitis, scleritis, iritis, dacryocystitis and trachoma. In ocular traumatism with pain, lacrimation and extravasation it renders early and material relief. Nitrate of silver, as utilized in the Credé method for combating ophthalmia neonatorum, has enjoyed general acceptance, but in some cases produced considerable irritation.

Other preparations are nargol, protargol, argentamin, argonin, itrol, largin, actol and abrin. Organic silver preparations are serviceable in suppurative conjunctival inflammations, phlyctenular states, purulent dacryocystitis, gonorrhœal ophthalmia and ophthalmia neonatorum. Holocain, eucain and nirvanin have been used as substitutes for cocain. As substitutes for atropin have been mentioned, eumydrin, scopolamin, homatropin and euphthalmin hydrochlorate. The latter is recommended mainly on account of its brevity of action, absence of untoward effects and minim disturbance of accommodation. Aspirin, a salicylic synthetic, is useful as a specific antirheumatic in rheumatic and gonorrhœal eye affections, because of the profuse diaphoresis it causes. Copper sulphate is being superseded by cuprol, a combination of copper with nucleinic acid, and which, possessing all the therapeutic efficacy of the sulphate, eliminates almost entirely its objectionable features. It is of distinct service in chronic conjunctivitis with cicatricial alterations of the mucous membrane after trachomatous disease. A 10 per cent. solution of cuprol produces either no pain at all or very slight pain, and causes very little irritation.



## BOOK REVIEWS.

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DIE AUGENAERZTLICHEN OPERATIONEN (Operations on the Eye). By PROF. DR. W. CZERMAK. 18th and 19th part. Vienna, 1904. Karl Gerold's Sohn. Price 7 marks.

With this part the magnificent work of Czermak, which we have time and again had occasion to recommend to the ophthalmic public, comes to an end. We cannot add anything to our former praise. No ophthalmic practitioner should be without it.

ENCYCLOPEDIE FRANCAISE D'OPHTALMOLOGIE. Published by F. Lagrange & E. Valude. Vol. IV. Octave Doin, Paris.

This volume contains the chapters on general pathology in its influence on the eye, on ocular semiology and on general affections of the eyeball. These articles are equally exhaustive as were those in the previous volumes. It seems hardly possible that they could be more complete. The names of the authors, viz., Berger, Morax and Rohmer are in themselves sufficient to guarantee excellent works and nobody who studies this volume will find his expectations unfulfilled.

THE OPHTHALMIC YEAR-BOOK FOR 1905. By E. JACKSON, M. D., Denver, and G. E. DE SCHWEINITZ, M. D., Philadelphia. Illustrated. Herrick Book and Stationery Co., Denver, Colo., 1905.

This is the second volume of the Ophthalmic Year-Book, and the name of Dr. G. E. de Schweinitz has been added to that of the initiator, Dr. E. Jackson. The résumé of the

more important articles on ophthalmic subjects is complete and well arranged. It is a very valuable compilation especially for those not able to read the original articles, and who can do so, since their name is legion?

UNTERSUCHUNGEN UEBER DIE PIGMENTIRUNG DER NETZHAUT  
(Studies on the pigmentation of the retina). By DR. C.  
HIRSCH, Berlin, 1905. S. Karger. Price 3 marks.

The study of a number of cases of pigmented retinae leads the author to the conclusions that it requires not only a vascular change in the choriocapillary bloodvessels, but also in the retinal ones in order to bring about the changes in the pigment epithelium which lead to pigmentation of the retina. He also states that the white line seen in cases of rupture of the choroid is not the sclera, but the torn lamina vitrea of the choroid.

The pamphlet is of great interest and well illustrated.

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#### PAMPHLETS RECEIVED.

La cheratocentesi studiata sperimentalmente. By Prof. Giuseppe Albertotti.

Blindness and oculomotor palsies from injuries not involving the optic or oculomotor nerves. By A. A. Hubbell, M. D.

36th Annual report of the Brooklyn Eye and Ear Hospital.

Interstitial keratitis, complicating ophthalmia neonatorum. By A. A. Hubbell, M. D.

Binasal hemianopsia; a case of neuritic optic atrophy. By W. T. Shoemaker, M. D.

Some contagious diseases of the eye and their treatment. By F. W. Alter, M. D.

Bemerkungen ueber Gruben, Kanaele und einige andere Besonderkeiten am Koerper des Grundbeins. By Prof. W. Waldeyer.

A case of exophthalmos following mastoiditis. By S. H. Large, M. D.

The differentiation of bacillus diphtheriæ, bacillus xerosis and bacillus pseudo-diphtheræ by fermentation tests in the serum-water media of Hiss. By A. Knapp, M. D.

Report of a case of flat sarcoma (endothelioma) of the choroid. Death one and one-half years later from general metastases. By A. Knapp, M. D.

Hereditary optic atrophy. By A. Knapp, M. D.

A bacteriological study of trachoma, with remarks on the occurrence of the influenza group of bacteria in conjunctivitis. By A. Knapp, M. D.

Reclination of the lens; under certain conditions a justifiable operation. By F. T. Rogers, M. D.

Two cases of recovery from toxic amblyopia. By D. B. St. John Roosa, M. D.

Loss of sight from disease of the eye (amblyopia ex anopsia). By D. B. St. John Roosa, M. D.

A new tube and method of operation upon the lacrimal duct to restore tear drainage. By J. W. Wamsley, M. D.

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## ORIGINAL ARTICLES.

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### TWO CASES OF IRITIS IN THE COURSE OF BRIGHT'S DISEASE.

By ADOLF ALT, M. D.,

ST. LOUIS, MO.

THE paper (June number of this journal) in which Dr. Semple related his experience with a case of iridocyclitis in Bright's disease, prompts the publication of the following two similar cases which I had occasion to observe.

*Case No. 1.*—W. G. F., who had been under my observation for 6 years on account of a refractive error, reported to me in great anxiety on Jan. 24, 1900, on account of a pronounced loss of vision in both eyes, which he thought he had first noticed some 3 weeks previously, but it had since grown worse. The patient was now 47 years of age, a strong, powerful, well-built man, apparently the very picture of manly vigor. He had no other complaints to offer. I found vision, which heretofore, with the proper correction, had been normal, except for a period of several weeks in which he suffered from what I had thought to be tobacco amblyopia in July, 1899, to be reduced to 20/100 in the right eye and to 20/50

in the left eye. The pupils reacted pretty promptly. An ophthalmoscopic examination revealed in the right eye a considerably swollen and clouded papilla, very broad and tortuous retinal veins and a number of white patches and small hæmorrhages in the upper part of the retina and near the macula lutea. In the left eye the swelling of the papilla was not so great and there was only one white patch in the lower part of the retina. The retinal bloodvessels were about the same as in the right eye. A rapid examination of the urine revealed a trace of albumen. I sent the patient to his family physician with a letter giving my diagnosis. The gentleman flatly contradicted and ridiculed it.

On Feb. 21, I saw the patient again. Vision was now R. 18/200 and L. 20/70. The albuminuric neuroretinitic symptoms were more pronounced than at the previous visit. Still, his physician could find nothing to substantiate my diagnosis, although the pulse was hard and high.

When I saw the patient on March 30, his vision was reduced to 16/200 in either eye. Both papillæ were very indistinct in outline and swollen; there were also a number of glistening white retinal patches and small striped hæmorrhages added to the old ones.

I now reluctantly suggested to him to consult somebody else about his undoubted kidney affection. He finally did so, and returned to me, on April 6, with a letter from the late Dr. Dérivaux, who not only concurred with me in the diagnosis, but stated that he had found a considerable quantity of albumen, and had placed the patient at once on a well regulated diet, etc.

On May 5, I was asked to call at the patient's house, because he "had become blind and had excruciating pain in his eyes." I found a great amount of chemosis of both conjunctivæ, so that the conjunctivæ protruded through the palpebral fissures. When, after considerable difficulty, I finally succeeded in inspecting the eyes, I found a plastic iritis in both, the left pupil being perfectly occluded by a whitish exudation. Vision reduced to 2/200.

Vigorous instillations of atropine began to succeed in dilating the pupils the next day, and in about 4 weeks the



iritis and all its symptoms had disappeared. At that time I was greatly astonished to find, also, that his discs and retinae were very much improved and vision again as good as it had been on Feb. 21.

The further history of the case I know only from his physicians, Drs. Dérivaux and Baumgarten, as I saw the patient only two or three times during the last few months of his life.

Patient died in March, 1901, just about 14 months after I had first made the diagnosis of retinitis albuminurica, of shrunken kidneys.

As I have stated above, he had been under my treatment in July, 1899, for what I then had, in the absence of any other symptom, and knowing the patient's habits, considered to be an amblyopia due to anæmia of both discs and retinae from the abuse of tobacco and, possibly, alcohol. True, this condition yielded very promptly to the exhibition of large doses of strychnia and abstinence, yet, I cannot help but think that this was, perhaps, the first eyesymptom of his kidney trouble, and that, in future, it would be well to pay some attention to the urine in doubtful cases of amblyopia—even when the patient's habits seem to give an easy explanation.

*Case No. 2.*—On June 30, 1899, C. A. F., a very stout, heavy-set man, brewer by trade, called on me to have his beginning presbyopia corrected. At that time the fundus was absolutely normal in either eye.

On Jan. 11, 1901, I was again consulted by him on account of loss of vision, which, although first noticed several months previously, had only now grown bad enough to bring him to an examination.

I found vision in the right eye 20/70, and in the left, 20/200. Ophthalmoscopically the right eye showed a swollen papilla with blurred outlines, veins tortuous and several small white patches near the macula lutea. In the left eye the papilla was considerably more swollen, its outlines invisible on account of exudation, and several large white patches and striped hæmorrhages in the outer half of the retina, with an indefinite star-like figure in the macular region.

My diagnosis of retinitis albuminurica was not only con-

curred in by his physician, Dr. J. B. Ross, but I was informed that the patient had been under treatment for albuminuria and heart disease for a number of months.

During the next 8 months I had occasion to examine the patient a number of times and found that, under the careful management of his case, he not only seemed to hold his own, but, although there was very little change to be seen in the fundus, I even found his vision at one time improved to 20/50 in the right and 20/100 in the left eye. This, however, did not last long.

On Dec. 12, 1901, I was called to the patient's house on account of his eyes having suddenly grown much worse. I found him in a miserable condition, sitting outside the bed suffering with œdema of both legs and gasping for breath. He complained of inability to see and severe pain in both eyes. There was chemosis, especially in the left eye and plastic iritis with numerous posterior synechiæ in both eyes. The intense pain subsided when finally the pupils had become fully dilated by atropine. The attack of iritis lasted barely 2 weeks when the eyes had resumed their previous condition.

I never saw the patient after this, as he died about 6 weeks later.

I need hardly refer to the scanty literature on the subject. To me it does not at all seem astonishing that we should meet with iritis in a disease in which the blood is vitiated as it is in Bright's disease. On the contrary, it is rather astonishing that we do not meet more frequently with these cases. Yet, I have so far only met with these two cases, in both of which the iritis appeared considerably later than the retinal symptoms due to Bright's disease.

In contradistinction to Dr. Semple's case, in which the iritis (or rather iridocyclitis) got well and the patient apparently also, my two cases emphasize the well-known fact that such patients but seldom live more than two years after the retinal signs of Bright's disease have made their appearance. In my first case the time was even considerably shorter.

As we acknowledge the existence of a diabetic and syphil-

itic, rheumatic and gouty iritis, we cannot deny the fact that there is also a Brightie or albuminuric iritis.

I might add here that I have under my observation a case of a very insidious iritis, which is not painful, in a gentleman, aged 55, suffering from lymphatic leukæmia. This iritis, also, developed some 6 months after I had first seen the case on account of leukæmic retinitis. The analogy to the previous cases is striking.

It does not seem that these forms of iritis have any decided symptoms by which we might distinguish them from other forms of iritis, although a more frequent observation of such cases may, perhaps, later on make it possible to find differentiating symptoms.

At least, I did not think that my cases offered anything peculiar in their aspect or in their course.

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## NOTES ON A CASE OF GUMMA OF THE OPTIC NERVE.

BY ADOLF ALT, M. D.,

ST. LOUIS, MO.

GUMMATA have been described as situated in almost all of the tissues of the eyeball. A gumma in the optic nerve seems so far not to have been seen or described. At least, even in the newest text-books on the pathology of the eye, I have been looking for it in vain.

The definite knowledge that a gumma may form in the optic nerve itself, between the chiasma and the eyeball, seems to be of considerable clinical value and apt to explain some dark features in cases of syphilitic atrophy of the optic nerve.

The history of the case is unfortunately not known. According to Dr. E. Tiedemann's statement, to whose kindness I owe the specimen, the patient, a middle-aged laborer, was brought to the St. Louis City Hospital in a moribund condition and died a day or two later. The post-mortem examination revealed gummata in large numbers in the brain, the lungs and heart, in fact, in almost every important organ.



In the left optic nerve, about one-half inch in front of the chiasma, there appeared a round swelling about the size of a pea, which, considered to be a gumma of the optic nerve by analogy, proved to be such by microscopical examination. (Fig. 1.)

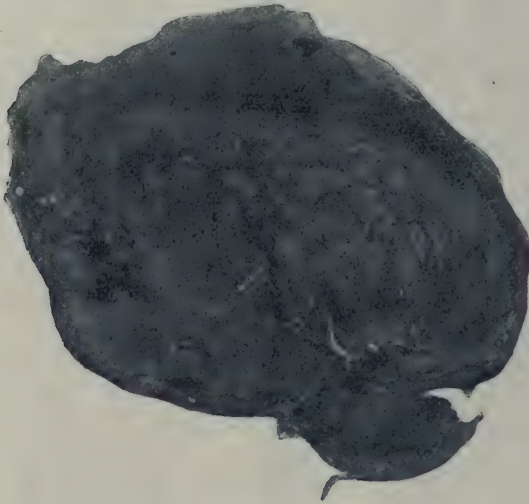


Fig. 1.

From the accompanying photograph it will be seen that the tissue which represents the nerve, forming in the transverse section a flat oval, is surrounded by a ring of dense connective tissue in which a great many bloodvessels lie embedded. Some of these are surrounded by large clusters of leukocytes, others show the signs of proliferating endarteriitis and periarteriitis, and some are totally obliterated.

The nerve proper, or at least what represents it, is a mass of poorly staining small round cells in which lie embedded islands of degenerated nerve fibres. These latter can no longer be in any way demonstrated, but the configuration still shows something similar to the normal arrangement of the optic nerve fibre bundles. A not inconsiderable portion of this tissue shows evidences of former hæmorrhage. In this mass of disintegrating tissue a few characteristic giant-cells are found, also a large number of diseased bloodvessels.

The specific endoarteriitis and periarteriitis is especially well seen in the portion of a very large artery, either the arteria ophthalmica or one of its larger branches, which has remained adherent to the nerve. This can be recognized in Fig. 1 in the little appendix below the nerve and in Fig. 2



Fig. 2.

under a higher power, where the immense number of layers of newly formed cells and the wavy lamina elastica are plainly seen.

The whole tissue stains but poorly, and, so to speak, in patches, showing that all the tissues concerned in the gumma are more or less devoid of nutrition and were doomed to death, even had the patient lived.

## NEW ATTEMPTS TO CURE CATARACT WITHOUT OPERATION.\*

BY PROF. L. DE WECKER,

PARIS, FRANCE.

(Translated by A. Alt, M. D.)

THANKS to the possibility of letting strong remedies act directly upon the tissues of the eye by means of injections, attempts to prevent or to cure cataract in its incipency have of late been resumed. In my opinion, that is all that can be attempted with our present knowledge of the anatomical lesions of the eye which lead to dimness of the lens. We know that in the very beginning there is simply a separation of the lens fibres with an unequal distribution of the nutritive fluid between the separated fibres. This displacement, due to the disassociation of the constituent parts of the lens, is sufficient to produce very pronounced opacities and to occasion quite a degree of obscuration of vision, but it is not unreasonable to admit that, without such lesion and without destruction of the constituting elements of the lens, it might be possible in some measure to put things to right again and thus to cure a beginning cataract, or at least to arrest the further progress of opacification.

The question is quite a different one when the cataract has progressed to such a degree that we have to deal with the destruction and softening of the fibres or with their shrinkage and an advanced sclerosis, that is, if we try to get rid of a cataract which has become complete. It is true that nature with her spontaneous curative resources shows us in this affection how she can put two distinct processes into operation to restore the lost vision. In one (applying to the first mentioned form, the cortical cataract) such a liquefaction of the cortical substance takes place that it may be totally absorbed and that the small nucleus sinks to the lowest parts of the capsule, thus rendering the pupillary area

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\* Annales d'Oculistique, March, 1905.



free, which then is occupied only by the two agglutinated walls of the capsule. The second mode of spontaneous cure lies in the shrinking of the subcapsular cellular elements and the sclerosis of the lens fibres which, by thus gradually reducing in size the capsule as well as the volume of the cataract, produce a traction on the zonula and detach it. Under the influence of the weight of the cataract the latter first becomes dislocated and spontaneously sinks lower, so as to free the pupillary area from all opacity. I have observed both of these modes of cure produced by nature and have described them in my treatise (Vol. III, 702 to 929.)

In the communication which I now propose to make I shall abstain from mentioning the attempts made to arrive therapeutically at these results of spontaneous cure. I shall restrict myself to describing the attempts made with the object: 1. To prevent the formation of cataract. 2. To arrest the progress of this affection, when it has commenced, and, 3, to reduce or even disperse beginning crystalline opacities.

1. In a recent book by an experienced confrère, Mr. Dransart,\* we find the following passage:

“I am very positive that it is possible to prevent the formation of a cataract in a great many cases. In fact, I believe that in many cases the cataract formation depends on a state of malnutrition, especially characterized by the imperfect elimination of urea. I have actually seen this in a great many cases. Most of the individuals suffering from cataract are rheumatics with an imperfect nutrition.” Mr. Dransart concludes: “With a good general hygiene, combined with antiarthritic treatment, and a perfect hygiene of the eye by means of proper glasses, we may succeed in almost half of the cases in preventing a cataract.”

Undoubtedly most cases of cataract are formed in arthritics with arterio-sclerosis, but it is going very far to say that we can prevent the formation of almost one-half of the cataracts. Nobody can deny the progress made in the treatment of arthritis, and, more especially, the perfection we have

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\* De la cataract dans ses rapports avec la cécité dans le Nord de France. By Dr. Dransart, Somain, p. 8.

arrived at in the correction of errors of refraction, but I do not know that even in those countries which are best supplied with prominent physicians and oculists the number of cataracts has decidedly diminished.

In spite of this, it is useful to more and more draw the attention of patients threatened with cataract to the analysis of the urine, especially for urea, the chlorides, and, above all, for sugar. It may very well be that an arthritic with arterio-sclerosis suffers from an intermittent diabetes and presents visual affections which show themselves as a change in the refraction and slight defects in transparency in the lens which may be effectively modified by an appropriate treatment. I am convinced that the repeated analysis of the urine is the best guide in the prevention and arrest of the formation of a cataract, on account of the indications for a rational treatment of the arthritic with arterio-sclerosis which is furnished by these analyses.

Here we must remember the observations which were made in the watering places intended for diabetics. The observations of Seegen and Gerhardt at Karlsbad have scarcely been credited. They found that vision improved *pari passu* with the diminution of the glycosuria, but they did not substantiate their observations by ophthalmoscopic examinations and an accurate determination of the visual acuity. This objection can, however, not be urged against the observation reported by Koenig,\* which concerned a patient who, having gone through a cure at Vichy, had recovered her vision and "the absolute integrity of her crystalline lenses."

2. The second question we want to study is the following one: *Is it possible, by proper treatment, to arrest the progress of a beginning cataract?* The greatest difficulty in the way of solving this question is the fact that the evolution of a cataract does not follow any regular course, and that there may be a standstill for months and years. In my own family I hesitated to tell some of its members that they had beginning cataracts and later on congratulated myself on this, since after a period which even reached 20 years I have been

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\* Bulletin et memoires de la Société Française d'Ophthalmologie, 1902, p. 431.

able to see that the opacities had remained stationary. I have, also, always instructed my pupils to abstain from prognosticating the time of ripeness of a beginning cataract, since I have only too often heard patients deride colleagues who had predicted a fixed date for the abolition of their vision, while the opacities remained stationary, as they had been at the time of their consultation. It is undisputed that crystalline opacities may become stationary at any stage and that, if treatment had been instituted, we are not in the least authorized to apply the dictum: *post hoc, ergo propter hoc*.

The treatment which in this sense has most aroused attention is the one which Prof. Badal, in 1902, has communicated to the Congress at Paris (*Compte rendu*, p. 442). As our confrère says: "He has never spoken of the cure of cataract \* \* \* , but only of arresting the evolution of this affection." Moreover, the 3 observations which are added to this communication refer only to the arrest of the progress of the cataract, and, astonishing as it is, the period of such control is no more than 9 months, 10 months and 1 year, respectively. It would be very easy for us to gather from our books a large number of cases in which, when we re-examined them after 2, 3 or more years, we found the identical visual acuity which we found at their first visit, although we had never instituted any treatment with this end in view. However, we must agree that the treatment to which our colleague at Bordeaux subjects his patients can hardly inconvenience them. It consists in the main of simple baths by means of an eyecup, morning and night, using a solution of iodide of potassium of 1 in 40, or, simpler yet, of the instillation of a collyrium of the same strength.

Badal prefers this easy treatment to the subconjunctival injections; yet, he does not prefer it only on account of the easy application of such baths and instillations, but, also, because he maintains that preparations of iodine penetrate more easily into the aqueous humor when they are applied in the manner mentioned. We might ask, of what importance the penetration of a little more or less iodine could be, since our colleague says: "The intact lens capsule seems to oppose an obstacle to the passage of the salts of iodine, and that, in



order to be able to note their presence in the lens substance itself, it is necessary to plunge the extracted lens into a saturated solution of potassium iodide; and this penetration goes on very slowly from layer to layer."

It is, therefore, not the direct action of the iodine salts upon the lens itself with which we have to reckon, and Mr. Badal asks, quite justly: "In order to act on a sick organ, is it necessary for the remedy to reach this very organ? Is it not sufficient to produce a modification which may act from a distance by means of the liquids which bring the nutrition to the tissues?"

This is the very reason why we give preference to the injections, when we want to arrive at the following desideratum:

3. The third attempt and the most recent one is to bring about a *regression and the disappearance of the opacities of the lens as soon as the cataract begins to form.*

Ever since opotherapy has come into use, I had, after the method of d'Arsonval, an extract made from the internal tissues and refractive media of the eye. This liquid, which Lagrange has later on used for injections to cure detachment of the retina (using only the extract of the ciliary body), we have employed in but a limited number of cases, which, moreover, did not stay long enough for us to form definite conclusions. We were guided by the idea that we might thus improve the nutrition of the lens by bringing to it elements lodged in the membranes and contents of the eye.

Students should again take up injections with such a fluid, or solutions of a remedy like potassium iodide, because we have the means to control their effect, not only in the ophthalmoscope and the text-letters, but because we are able to put the patient himself in a position to follow the progress or regression of their affection, either by means of a card perforated by a pin, or of Darier's advice,\* who lets the patient gaze at a candle flame at 5 metres, holding 1 centimetre from the eye a biconcave lens of 30 or 40 dioptries. Thus he sees a light disc of a diameter which corresponds to

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De la possibilité de voir son propre cristallin. *Bullet. de la Soc. Franc. d'Opht.*, Paris, 1895, p. 515.

the width of his pupil on which the smallest opacities which interfere with the transparency of the lens are visible.

Dr. Verderau,\* at Barcelona, has related an observation, unfortunately the only one, in which the visual acuity rose from 1/10 to 2/3 in a comparatively short time, after he had made 18 injections of potassium iodide in a little more than two months. Although this is only one observation, it merits our attention and should prompt us to try about 20 injections in patients who desire to submit to a proper treatment in order to remedy their loss of vision, informing them that the experiment should not last more than 2 or 3 months, during which an injection should be made every 3 or 4 days.

The solution used may be that of our colleague of Barcelona, containing 5 per cent. potassium iodide, with the addition of 1 per cent. acoine, or 2 per cent. cocaine. This solution, well sterilized, is put up in little tubes containing a cubic centimetre of the solution, the ends of which are not broken until the very moment of using it. It is best to use only half a cubic centimetre (half a Pravaz syringeful) at each injection, since even this dose is quite painful; when but 4 to 6 drops are injected the patients feel no pain.

There is another precaution to be taken, that is, the injection must not be made under the conjunctiva, since such a quantity of fluid causes a chemosis, which is disagreeable to the patient, but deeper, in order to make it intracapsular, like the one for retinal detachment, because then only a small quantity of the fluid raises the pericorneal conjunctiva.

The trials made with such iodine solutions are still too new for my judgment of their value, but I think I can advise that they be employed, and that the patients who come to the physician asking whether nothing can be done to remove the cataract threatening their vision, are not systematically given a negative answer.

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\* Clinique Ophtalmolog., Nov. 1904, p: 368.

## SELECTED ARTICLE.

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### A CONTRIBUTION TO THE STUDY OF STRABISMUS, WITH ESPECIAL REFERENCE TO THE OPERA- TION OF PANAS FOR ITS RELIEF.

AN ANALYSIS OF 225 OPERATIONS ON 120 SUBJECTS.

BY PROFESSOR EDWARD S. PECK, A.M., M.D.,

Professor of Diseases of the Eye, New York Post-Graduate Medical  
School and Hospital; Consulting Ophthalmologist to  
the City Hospital, New York City.

A proper study of strabismus, or squint, embraces not only a study of the act of deviation itself, but of the causes leading up to the deviation, the pathological processes involved in it, and the best method of overcoming it. The subject has been so thoroughly written up in monogram and manual that, to furnish another contribution seems on first thought unnecessary, if not presumptuous. At the present day, however, so much has been brought forward of interest and profit, that my attempt will be confined to emphasizing the suggestions of Donders, Javal and others as to the dependence of strabismus on the errors of refraction of the eye—a theory whose basis is a purely physiological one. To do this, a brief retrospect of the essential elements of strabismus is necessary.

What is strabismus? The word is an old Greek one, meaning squinting. Strabismus is an inability to bring the visual axes of both eyes simultaneously on one point, the axis of vision of one or both eyes always deviating in a certain direction from the object looked at. It is on the one hand the result of errors of refraction, equal or unequal in both eyes, an inequality of the meridional planes of the eyes; or, on the other hand, it may be due to imperfect innervation, weakness, or paralysis of one or more of the extrinsic muscles.



Strabismus is divided, according to the direction taken by the muscles, into convergent, divergent, upward or downward. Convergent represents about 85 to 90 per cent. divergent about 10 to 12 per cent.; upward now and then a case, while downward squint is very rare. Sometimes strabismus is of a mixed variety, as when the convergent form has associated with it an upward squint. Strabismus may be confined largely to one eye, but both eyes always participate in it, unless it be traumatic, paralytic, or consecutive to other disease. A purely monolateral squint does not exist except under the conditions just named. Strabismus may be continuous or periodic. From the standpoint of dynamics, it may be concomitant or functional on the one hand, or paralytic on the other. The terms concomitant and functional are synonymous. In his classical treatise on the "Errors of Refraction and Accommodation," published by the Sydenham Society of London, Donders first brought out the intimate connection of functional convergent strabismus with hyperopia. Donders found that, of all convergent strabismus eyes 75 per cent. were hyperopic. When one reflects that these facts were suggested before the invention of the ophthalmoscope by Helmholtz, the importance and the classical character of Donders' work may be inferred. Edward T. Ely, a pupil and later associate of our President, Dr. Roosa, and for many years until his death my colleague, wrote an elaborate and painstaking essay on the study of the refractive conditions of the eyes of the newly born, and found 80 per cent. hyperopic. Horner, Roosa, Scrinì\* and others contributed studies on these same lines. Later, Javal emphasized astigmatism, and the unequal refraction of the two eyes of the individual, called anisometropia, as causative factors of strabismus. It is a well-known fact, amounting almost to an axiom, that refractive error is bilateral, and usually equal in both eyes; and that, if astigmatism be present or complementary, this is usually in the same meridional plane

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\* Scrinì: Archives d'Ophthalmologie, 1901, p. 241. found in 136 newly born 60 alternating and periodic cases of strabismus; it was greater among the children of primiparous than among those of multiparous women.

in each eye of the individual; this occurs in 80 per cent. of the cases of strabismus. We must remember that accommodation is a function of the ciliary muscle, pure and simple; that convergence is an act of the internal rectus, and is a complement of and reinforces the act of accommodation. Convergence is an extra-ocular act, accommodation is an intra-ocular act. We must also remember that astigmatism and anisometropia are purely anatomical failures, either of the cornea or lens, or both. If the concomitant character of strabismus is granted, as evolved by the elder Graefe, and by whom this name was given in the antithesis to non-concomitant or paralytic strabismus, then the first radical step in the conception of the strabismic act has been taken, viz., its character is bilateral and not monolateral; both eyes participate in it; and it is not alone a lesion of muscle and nerve, but it is a functional loss of equilibrium, due to errors of accommodation and refraction primarily, and assisted in some cases by faulty attachments of extrinsic muscles, or by a feeble innervation or absence of these extrinsic muscles, or by other anatomical or pathological vices of the orbits.

I would prefer to leave this feature of the essential causes of strabismus to others, who may care to take it up for discussion; it has played a very prominent role in scientific writings in this and other countries, with a view to the management of *positive* or convergent squint, and of *negative*, or divergent squint.

I will also leave to others to elaborate the methods of orthoptic (Javal) treatment in young children, which has proved eminently successful in many conservative hands. The work of Dr. Davis\* and Dr. Derby of New York on lines formulated by Javal is most noteworthy, and deserves careful study. Do not forget that the ideal of successful treatment of any case of strabismus depends on the establishment of binocular vision, with the suppression of a manifest or latent diplopia by means of the stereoscope, excur-

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\*Davis, A. E., Post-Graduate, March, 1901. "Non-Operative Treatment of Strabismus; Its Possibilities." In this paper Javal's orthoptic exercises and Priestley Smith's educational treatment are detailed.

sions in motility, the exclusion-pad, bar-reading, and even atropin. It is always preferable to any operative method in very young and carefully selected cases.

In this connection, I wish to note that there have been two periods of the history of the study of strabismus. The first dates from the teachings of Stromeyer and Dieffenbach in 1838, when squint was recognized as a muscular deformity. The second was initiated by Helmholtz, and elaborated by Donders; by them, squint was regarded as an optical anomaly, and due chiefly to hyperopia and the normal habit of convergence, in which an inordinate contraction of the ciliary muscle or ciliary ligament is established. Increased nerve-impulse is imparted to the extrinsic muscles, or the interni. In emmetropia all attempts of accommodation are accompanied by convergence. In hyperopia the interni show a contractile power greater than that of the ciliary muscle. In myopia the opposite condition prevails. Hence it follows that hyperopia leads to inordinate strength of the interni—whereas myopia weakens them by lack of nervous stimulation. When binocular fixation is abandoned, convergent or divergent squint results.

As typical divergent strabismus is associated with myopia, so typical convergent strabismus is associated with hyperopia. Divergent squint, however, by exception, is oftener found with hyperopia than is convergent squint with myopia. If divergent squint is a passive act due to relaxation, non-use, or disuse, then convergent squint is an active act, and implies spasticity, and contracture of a muscle, and is usually associated with the act of accommodation.

Either theory must carry with it its own therapeutics—the first or purely muscular theory of Stromeyer and Dieffenbach, by operations on the muscles; the second, or accommodative refractive theory of Donders, by a correction of refractive anomalies.

Two years ago Claud Worth\* made some characteristic observations of the subject of strabismus, which I shall reproduce in brief here. He wrote that squint is not a disease,

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\*Worth: Squint. *Archives of Ophthal.* 1903, p. 509.



but a symptom. He found that 81 per cent. of convergent strabismics have perfect abduction. When the macula (by disuse) has ceased to be the most sensitive part of the retina, the eye then wanders without remaining steadily in any definite position; this is *lost* fixation; or it may fix with some part of the paracentral region, or with a point of the extreme periphery; this is *false* fixation. He further states, if an eye with a false macula be put straight by operation, crossed diplopia is produced. Congenital amblyopia is very rare, which he claims can be checked by stimulating the macula. He adds: hyperopia is one of the causes of squint, of which the principal one is a partial or total absence of the fusion-sense.

In this connection Landolt of Paris has written at great length an ingenious and subtle argument, built upon a physiological framework. I shall take the liberty of reproducing it here, as it is a classic contribution to the literature of this subject, though its deductions as to operative work have not found acceptance even among his own confrères. In spite of his belief in the theory of Donders, that concomitant squint is a binocular affection, he writes 40 years later that, our knowledge of the anatomy and physiology of ocular muscles is still insufficient. He states that in convergent strabismus both external recti have grown weaker, while in divergent strabismus both internal recti have grown weaker. Hence follows an argument for *strengthening* the weakened muscles of a strabismic eye, instead of *weakening* the deviating muscle; that is to say, he would make an advancement of the external recti muscles in convergent strabismus, and of the internal recti in divergent strabismus. He recognizes that tenotomy of the deviating muscle is easier, but argues it is not physiological. The centre of rotation of the eyeball is not fixed, as has been asserted, but is movable; it is due to the resultant effect of all the forces which hold the eye in position, and which move it. One of the functions of the four recti muscles is to retract the eyeball, while the oblique muscles draw the eye forward. If tenotomy of a deviating

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†Landolt, *Archives of Ophthalm.* 1897, p. 5, *Ibid.* Norris and Oliver; vol. iv. pp. 1 et seq.

rectus muscle weakens it, then the oblique muscles increase their power, and pull the eyeball forward, so that it projects beyond its normal plane. This is one reason why a tenotomized muscle reattaches further back on the eyeball; another reason of greater weight is that found in the rotation of the eyeball, which displaces the axis of fixation further outwards, and away from the vertical plane, by contraction of the untouched antagonist muscle. Projection of the eyeball forward is further increased by the fact that the tenotomized muscle contracts more than its antagonist because, the muscle being detached, only the check-ligaments, or Tenon's capsule, which follow the course of the recti muscles, run towards the orbital margin. Landolt argues that the mobility of an eyeball must suffer after tenotomy, and adds that the success of a tenotomy depends on this loss of mobility. An antagonist never gains as much as a tenotomized muscle loses. By a tenotomy the muscle-cone loses its previous proportions, and the muscles forming this cone embrace it less than before. On the contrary, advancement of the antagonist forces the eyeball deeper into the apparatus, or zone, of motility; and, on account of this retrogression of the eyeball, advocates of advancement are wont to argue the increase of motility of an eye.

The argument is a specious one, though based on well-established physiological laws, and well-known anatomical facts; but its author possibly forgets that, in a tenotomy of the internal rectus for convergent squint, a certain amount of projection being admitted, three long recti muscles remain, whose conjoined efforts in maintaining the muscular zone are nearly equal to the contracting power of the internus; the ratio of dynamic power of the rectus externus to the rectus internus is 1:5 or 6, and that of the superior and inferior recti is 1:7 or 8. In addition, the power of the obliqui to propel the eyeball forward is exceedingly slight. It is also well known that the perimetric field of vision of an eye is but little constricted three or six months after a complete tenotomy of the internal rectus; the excursion towards the nasal limits remains at about 45° or even more. It is, furthermore, an admitted

fact that Landolt, accomplished scientist as he is, performs tenotomy of a deviating muscle oftener than an advancement of the antagonist. For no one recognizes better than he how much more difficult of execution is an advancement operation, and how many more important operative features there are to overcome in it. The nicest quality of exactness in measurement, as well as the most perfect instruments, are required. I fear, if those of us who relied upon advancement pure and simple for the rule of our procedure in convergent squint, laid the bare facts to view, it would be found that we sought an accessory tenotomy to complete an otherwise unfinished operation. I have introduced Landolt's arguments because they were ingenious, were based on physiological principles and anatomical facts, have found many followers, and were published in one of the most scientific and conservative archives of our day.

In undertaking the intelligent care of a case of strabismus, knowledge of the insertion of each rectus muscle to the eyeball is necessary.

The *internal* rectus is inserted 5.5 mm. from the inner corneal margin; it directs the eye strictly inward. It is the shortest, the broadest and the strongest of the four recti.

The *inferior* rectus is inserted obliquely 6.5 mm. from the inferior corneal margin; it directs the eye downward and inward; it is shorter than either the superior or external rectus; it is stronger than the superior, but is weaker than the external rectus.

The *external* rectus is inserted 7 mm. from the external corneal margin; it directs the eye strictly outward; it is larger than the inferior, but shorter than the superior rectus. It has two heads of origin at the common ligament of Zinn, and the foramen lacerum posterius.

The *superior* rectus is inserted obliquely 7.5 mm. from the superior corneal margin; it directs the eye strictly upward; it is the longest and the weakest rectus muscle.

The *superior* oblique directs the cornea of the eye downward and outward. The *inferior* oblique directs the cornea upward and outward.



*Strabometry, or the Measurement of Strabismus.*—It is necessary to determine the angle of strabismus, and the same methods apply to all forms of strabometry. What is the angle of strabismus? It is the angle comprised between the direction which the line of sight of an eye has and that which it ought to have. The angle of strabismus is then the amount or degree of deviation. We must know not only the *qualitative* analysis of strabismus, but still more the *quantitative* analysis. There are a number of methods, but those chiefly in vogue as most practical are first, by a linear strabometer, such as Lawrence's single ivory shield, or Landolt's parallel sticks; second, by a graduated semi-circle, such as a perimeter, or ophthalmotrope or tropometer; these are more exact than the linear strabometers, and more expensive. Foersters' perimeter, Landolt's ophthalmotrope, or Stevens' tropometer, will answer the purpose; third, subjective strabometry, or that test which is based on the principle of the baseline between double images being the tangent of the angle of strabismus; Donders employed this method largely; fourth, the method by prisms, which is based on the principle that luminous rays passing through a prism are deflected towards its base, or thicker portion, and away from its edge or thinner portion; and that objects looked at through a prism are seen displaced towards the wedge, or prism-angle.

Of these, the two most popular and accurate methods of measuring a strabismus are by means of the ophthalmotrope, or tropometer, and by means of the prism.

One word in regard to the use of prisms for this purpose of measurement. Luminous rays, which would not otherwise reach the fovea centralis of the macula of a deviating eye, are made to fall direct upon it; at the moment of this physiological act, images of diplopia are fused so to speak, or rather are superposed, in such a way that single vision results; the degree of strabismus is equal to one-half the degree of the so-styled correcting prism; for the prism fuses the diplopic images, and functionally puts an end to the strabismus. Prisms are liable to error in this way; if too weak, or if weaker than the angle of strabismus, the double images are brought nearly up to the point of fusion, when the tendency

to binocular single vision is aroused in the individual, and the paretic muscle attempts to fuse the two images and fails; or if the prism be too strong, the images first fuse and then cross, and the paretic muscle finds itself powerless to restore the fusion-point with success. The proper correcting-prism is the one which stimulates and maintains the fusion of the double images. Of these methods, the prism-test is the most physiological, the tropometre is the most practical. All define the measurement of the angle of deviation and express its definition in degrees.

The true language of displacement should be in degrees and not in lines or millimeters, as we are too much in the habit of employing. Expression of the deviation of an eye is an expression of the value of an angle; it should not be expressed in lines, inches, or millimeters, as English-speaking races are prone to do, but always in degrees. Displacement is not along a line, but around a plane of rotation and fixation, whether that plane be vertical, as in convergent and divergent squint; or horizontal, as in upward and downward squint. We must not forget, as was said before, the tendency of patients with deviating eyes to fuse double images. We may find that the degree of strabismus is less than the degree of diplopia by  $1^{\circ}$  or  $1.5^{\circ}$ . This is the secret of orthoptic treatment; and its success is based on the proper selection of prisms, as first used, to establish fusion-images. Du Bois-Reymond first suggested the service of the stereoscope in the treatment of strabismus, but Javal put the principles into practical service in ophthalmology.

Operative treatment having been decided upon in a given case of strabismus, I assert with emphasis that no operator, however practiced or clever he may be, undertakes operative interference for its relief by any method without feeling much anxiety as to the results. This anxiety is not on account of over-correction of the deviation, but on account of under-correction. As to success of correction, I have never been able to appreciate the emphatic "caution" of text-books, not to cut too much, as an excessive operation, or a squint in the other direction, might result. In a series of nearly 3,000 cases I have never seen this result but 10 times, and those



cases were seen in from one to 20 years after the operation. Two of these were patients who promptly developed neurotic or psychic symptoms, due to heredity. The anxiety to which I allude is that the relief of strabismus will not be complete in one session, or that an under-correction will follow. This statement may be made in varying degree of all the methods of *simple* tenotomy. The best methods hitherto in vogue have been brought forward by Arlt, von Graefe, Critchett, Snellen, Prince, Stevens, Schweigger, and others; and of these operations, more or less original, there are manifold modifications. They are all modeled after the operation of Dieffenbach, which in 1839 was the first operation performed on the living human subject. The suggestion came from Stromeyer, and was inspired by his results in myotomy on the cadaver in 1838. Guerin at the same time made a subconjunctival myotomy of the internal rectus muscle with a sharp-pointed knife, cutting upwards against the rectus tendon just as Stromeyer severed the tendo Achillis by a subintegumental incision.

Objection may properly be made to any method which involves the necessity of repetition, and sometimes multiple repetition. The "dosage of tenotomy" is itself a malady to be cured. None of these methods offers in advance any definite guarantee of full, complete success in one session. The operation of Professor Panas, of Paris, offers the greatest possible guarantee of success by one intervention. I offer a liberal translation of his own communication to the Academy of Medicine, Paris, session of July, 1898. It was his second paper on this subject, and is published in full in the *Archives d'Ophthalmologie*, July, 1898, p. 401. The patient being chloroformed, the usual antiseptic means are employed, by preference a solution of biniodide of mercury, so universally used in Paris hospitals. The conjunctival fold is seized horizontally over the rectus tendon, and tendon and subconjunctival fascia are incised. A short strabismus hook is introduced deeply into the buttonhole, and by a brisk movement in circumduction, tendon and tendinous envelope are embraced within the hook. Holding the loaded hook up in the air, slowly progressive tractions are made



without jerks or twitches, until the inner border of the cornea attains without much resistance the external lid commissure. Panas never succeeded in making the least rupture of the tendon of the muscle under traction—an accident not likely to be made when one recalls that, with a weight of five kilogrammes (about 10 lbs.), the muscle of dogs could not be broken. Spasmodic jerks must not be made, as a feeble muscle might be broken. Having completed the elongation of the muscle, one proceeds in the usual way to a complete tenotomy of the tendon down to the surface of the sclerotic; to be assured that no adhesion or tendon remains, the hook is passed to the upper and lower border of the muscle, and every remnant of tendon or attachment to the sclera is cut free. The hook is then released, bleeding checked, and the conjunctival wound is closed by a suture of catgut, and the conjunctival sac irrigated. Precisely the same procedures are carried out immediately on the other eye.

At first, under fear of an over-correction, especially when the deviation was mild, not exceeding  $10^{\circ}$  to  $15^{\circ}$ , traction was limited to the eye with fixed strabismus, while a simple tenotomy was made on the other eye; but clinical experience gave overwhelming proof to the author of the operation that elongation of the muscle in each eye was a condition of success; and since then he has always executed this double procedure. Both eyes must be kept bandaged 24 to 48 hours. Aside from a small amount of ecchymosis at the point of traction and tenotomy, conjunctiva and sclera preserve their normal aspect; in five or six days, when the suture either falls out or is absorbed, cicatrization is perfect. After a proper correction of the ametropic and astigmatic errors, usually present in such cases, patient is discharged about the 10th day. In order to the perfect establishment of binocular vision, exercises by the stereoscope or other orthopic means should be begun and continued a long time with intelligence and persistency. Such is the description given by Panas of this simple operation. The salient points are two: first, the operation must always be done on the two eyes simultaneously; second, elongation and tenotomy of the same muscle must be complete.

Panas' first figures were briefly as follows: He operated on 220 subjects, of whom 210 were cases of convergent and 10 of divergent strabismus. Of the 210 convergent squints, 180 had complete and immediate parallelism, while in 30, or in  $1/7$ , a certain degree of convergence remained. Three-fourths of his patients with convergent squint were among children of 5 to 16 years of age; about one-fourth were individuals between 16 and 30 years of age; 12 were emmetropic and almost all the remainder were hyperopic, usually unequally so in both eyes, and usually accompanied by direct or inverse astigmatism. Fifteen of the convergent 210 were mildly myopic, except one individual, who had a myopia of 4 D. As is the rule, so with his cases, the fixed strabismic eye was the more ametropic of the two. The angle of deviation varied from  $10^{\circ}$  to  $30^{\circ}$ . None showed a persistent over-correction.

Of the 10 divergent squints, the recoil of the externi after elongation and division was complete in eight cases; in those cases the angle of strabismus was under  $25^{\circ}$ , and the recoil was sufficient to overcome the angle of diplopia and of divergency, while in the two other cases, having an angle of  $25^{\circ}$  to  $30^{\circ}$ , a capsular advancement of the opposing interni was made at the same time with ultimate success. Of these 10 divergent cases, those from 20 to 25 years of age with a divergence of  $25^{\circ}$ ,  $30^{\circ}$  and  $35^{\circ}$ , received the operation by elongation and tenotomy of the two externi, and later advancement of the two interni. Every operator knows how much operative correction of concomitant divergent squint leaves to be desired; how unsuccessful, or, at best, how half successful these interferences are.

I have refrained from a further elaboration of Panas' tables on account of the necessity of brevity. The reader must study them for further purposes. I think it requires no stretch of the imagination to argue a real progress over previous methods of simple tenotomy on one or both eyes.

In the *Post-Graduate Monthly* of March, 1900, under the title, "Results of the Panas Operation for Strabismus," Professor Roosa contributes a report of 40 cases, 25 operated on by himself, 14 by Dr. Martin, of the Manhattan Eye and

Ear Hospital, and one by Dr. A. E. Davis. In brief, his summary is as follows: "Perfect results" or parallelism in 34 cases out of 40. Roosa further had an "entirely satisfactory" result in two other cases operated on within the month of his writing. His own cases, 27 out of 42, had been carefully followed and estimated by himself, some of them for over a year after the operation; he regarded the conditions observed as approximately final. In Dr. Martin's 14 cases, operated on during his House Surgeonship at the Manhattan Eye and Ear Hospital, 11 preserved parallelism, 2 showed a "slight convergence," and one showed a "very slight divergence." In the single case of Professor Davis, a "slight divergence" existed 3 months after the operation. Roosa had out of 27 cases only one with imperfect results—that was a child of 3 years "who had lost the power of fixation" before the operation; in this case the squint was "entirely overcome, but the power of fixation in one eye is still not perfect." In brief, in 42 cases, there were 38 perfect results; two under-corrections and two mild over-corrections. Roosa's contribution has been republished in the *Archives d'Ophtalmologie*.

In a subsequent paper, in the *Medical Record*, May 3, 1902, p. 687, and later reviewed in the *Post-Graduate Monthly* under the title, "Functional and Paralytic Strabismus," Roosa pleads for a proper understanding and nomenclature of strabismus as a bilateral, and not a monolateral disease. Cases of paralysis of one or more of the recti muscles of an eye, depending upon an anomalous position of the macula lutea may produce a strabismus that is really monolateral; and these cases can be straightened by various orthoptic or educational measures; these may, or may not, be the results of central encephalic or spinal lesion. Roosa quotes the late Dr. Agnew, who for many years was accustomed to teach his pupils that it made very little difference which eye is cut at the first session; his idea being that true functional strabismus was bilateral. Roosa's 42 cases (including Martin's and Davis' cases) are presented in tabular form, and are very interesting.

In a communication to the Academy of Medicine, of



Paris, published under the head of new statistics of the operation for strabismus in the *Archives d'Ophthalmologie*, 1901, p. 305, Panas reviews his own statistics of 210 cases of convergent squint, 10 cases of divergent squint, also Roosa's 42 cases.

I shall detain you but a moment with his introduction of Terrien's cases in the ophthalmic service of the Hotel Dieu. There were 68 operations, 58 for convergent and 10 for divergent squint, a remarkable disproportion in favor of the divergent variety, and showing a large amount of myopia. Sex was about evenly divided, as it always is. As to age, 45 of the 58 convergent cases were from 5 to 20 years old; 10 cases were from 20 to 30 years; one was 34 years, and two were 40 years of age.

Strabismus appeared at birth, or before end of the first year of life in 10 cases; it appeared between first and second years in 13 cases; between the second and third years in 12; at six years in one case; not noted in 22 cases.

11 had an angle of strabismus of  $18^{\circ}$  to  $20^{\circ}$ .

42        "        "         $20^{\circ}$  to  $30^{\circ}$ .

2        "        "         $30^{\circ}$  to  $40^{\circ}$ .

2        "        "         $40^{\circ}$  to  $60^{\circ}$ .

1 not noted as to angle.

Of equally refracting eyes in the same individual, or isometropes, there were 21 cases; of unequally refracting eyes in the same individual, or anisometropes, there were 37 cases; that would be a very unequal division for statistics in this country; in any country outside of Switzerland or France it is a very remarkable ratio. Terrien's tables taken from the service at the Hotel Dieu, Paris, show the greatest number of strabismics to be between 10 and 20 years of age. In this clinic, as almost everywhere, it is not the practice to operate on eyes under four to five years of age—and perhaps not under six years of age. It is a well-recognized fact that many forms of strabismus are modified, lessened, and end in a complete or almost complete disappearance in the first years of life on account of the cranio-facial development. These are the years of selection for orthoptic exercises and judicious correction of ametropia and astigmatism. If suc-

cess does not follow our efforts in these years of early youth, then surgical interference must be resorted to.

The suggestion to begin a series of operations for the relief of strabismus by the Panas method came to me through our distinguished President, Professor Roosa; I cannot thank him sufficiently for the inspiration of that suggestion.

With your indulgence I will give a brief synopsis of my cases, and will say that the number of patients was 120, on whom 225 eyes were operated on by Panas' method; 15 individuals were operated on as to one eye, and 105 individuals as to both eyes. These 15 individuals had elongation and tenotomy of one deviating internus muscle only under fear of over-correction; of these 15 persons, eight have received traction and tenotomy of the opposite internus at a second session, while 105 persons received traction and tenotomy at the initial session. Of the 120 individuals, 110 were cases of convergent, and 10 of divergent strabismus. The youngest was two years and four months; the oldest 59 years of age.

3 were under 5 years.

20 were between 5 and 7 years.

25           "       7 and 10   "

38           "       10 and 20   "

24           "       20 and 30   "

5            "       30 and 40   "

3            "       40 and 50   "

1 was a woman 53 years, widow.

1 was a man 59 years, widower.

Of the 120 individuals 67 were females, and 53 were males.

I am unable to give correct figures of the time of first appearance of the strabismus; relative statistics on this point are as follows, and they are based on the statements of parents or sisters, and, as such, are only relatively correct; 25 were stated to appear within the first year of life; 35 between the first and second years; 30 between second and fourth years; 2 between the fifth and eighth years; one at the 36th year, following typhoid fever; six at or about the development of puberty, and 21 were not noted.

*Angle of strabismus.*

16	had	an	angle	of	10°	to	15°.
25	"	"	"	"	15°	to	20°.
39	"	"	"	"	20°	to	25°.
18	"	"	"	"	25°	to	30°.
10	"	"	"	"	30°	to	35°.
5	"	"	"	"	35°	to	40°.
2	"	"	"	"	47°.		
1	"	"	"	"	48°.		
1	"	"	"	"	50°.		
1	"	"	"	"	58°.		

*Refraction of Both Eyes.*—There were 74 patients with equally refracting eyes, or isometropes, and 46 with unequally refracting eyes, or anisometropes. Of the 74 isometropes, 65 were hyperopic and 9 myopic; none of these myopes had less than 1.5 to 2 D., and one showed 6 to 6.5 D. of myopia. The tables will show in detail the quantitative definition of hyperopia and myopia among these isometropes; as also the quantitative definition of refraction and astigmatism among the anisometropes.

Of the 110 patients with convergent strabismus, there were 98 immediate and permanent results as to parallelism by traction and tenotomy made in one session; there were 3 over-corrections, 2 of which occurred 2 years ago, and have assumed parallelism without operative interference, and the third patient has disappeared; there were nine cases of under-correction, 3 of which have been cured by a simple advancement of the external recti, 1 by 1 stitch and 2 by 2 stitches on each eye; 4 have been cured by reopening of the conjunctival wound within 2 weeks after the initial tenotomy and by incision of some capsular remnants, and always on both sides; while the other two cases still show some convergence.

Of the 10 cases with divergent strabismus, 9 showed immediate perfect results, the first one having been performed 30 months ago; the 10th case with amblyopia due to myopic choroiditis was imperfect, and was reinforced immediately by the tucking advancement of the interni of my colleague, Prof. Valk, and was a perfect success.



*Incidents of the 120 Operations.*—General anæsthesia was used in all patients under 10 years of age, except in five cases, or a little more than 40 per cent.; cocain and adrenalin in the remainder; general anæsthesia was usually nitrous oxide gas followed by ether. Chloroform was used in five cases under six years of age.

In one instance the internal rectus muscle was ruptured; it was followed by a marked and immediate propulsion of the eyeball forward, by rapidly increasing amblyopia (10/200 vision), general fever, recovery in six days; final vision of this eye was 20/30; previous vision was 20/100. A perfect recovery from strabismus resulted without interference. In one instance the external rectus was ruptured, the muscle being very small. Valk's buckling advancement was used, and recovery from a divergent squint resulted. No other untoward accident attended the other operated cases.

It is not necessary to elaborate here the causes of amblyopia, either of mild or severe form, in the list of those who presented them.

There are many most interesting scientific and clinical questions that arise out of this subject of strabismus, to which I shall simply allude in this connection. For instance, the displacement of the fovea centralis in false fixation of the strabismic eye; the relation of the angle of strabismus to the degree of amblyopia; the relation of the angle of strabismus to the dynamic power of the muscles involved in the deviating act; the alleged propulsion of the eye forward due to tenotomy; the alleged retraction of the eyeball backward, due to advancement. At what earliest age of infancy may strabismus be developed? Does functional congenital strabismus exist?

On the side of clinical interest I will suggest the following inquiries: How long may stereoscopic efforts be employed with a hope of ultimate success? In the Panas operation by traction and tenotomy, how long may a muscle be safely held in tension by the hook? How often may traction be made to insure a successful result by one intervention? These are practical clinical inquiries which are determined by the age of the patient, length of time of the strabismic act, the degree of deviation, and the experience of the operator.

Mr. President, in closing this presentment I find no need of arguing what seems to me a foregone conclusion as to the superiority of Panas' operation for strabismus over every other one, so long practiced. The results of Panas, Roosa and others are too convincing on this point. I can only urge my colleagues and those who practice ophthalmology, to satisfy themselves as to the deductions here made.—*The Post-Graduate.*

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## ABSTRACTS FROM MEDICAL LITERATURE.

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By W. A. SHOEMAKER, M. D.

ST. LOUIS, MO.

### SEPTIC THROMBOSIS OF THE CAVERNOUS SINUSES.

E. C. Ellett (*Jr. Am. Med. Ass.*, Dec. 17) records three cases, and discusses this condition on account of the apparent eye symptoms. The disease being rare, the actual condition is liable to be overlooked at first until it is called to mind, when the diagnosis is not difficult. The general symptoms are those of sepsis under any circumstances. The local symptoms are those due to (a) venous obstruction, causing œdema and chemosis of the affected area, viz.: the orbit, the skin of the nose, forehead, cheek, and sometimes fauces, pharynx and neck; exophthalmus, a prominent symptom being due to engorgement of the tissues of the orbit; and (b) pressure on the second, third, fourth, sixth, and ophthalmic division of the fifth nerves. The ophthalmoscope shows dilated and tortuous veins and œdema of the retina. The œdema of the lids of the second eye, beginning at the inner canthus and not due to direct extension, is important and characteristic.

The diagnosis must be made from tenonitis, orbital cellulitis and facial erysipelas. The prognosis is uniformly bad. Operation has not often been resorted to, but since the prognosis is otherwise absolutely bad, Ellett thinks that operation should be tried.

In discussing the subject, Dr. S. D. Risley made the point that when we have an infectious process, the area of which drains into the cavernous sinus, we should be on our guard for thrombosis of the sinus.

CONTRACTION OF THE VISUAL FIELD; A SYMPTOM OF ANESTHESIA  
OF THE RETINA IN CHILDREN.

L. Webster Fox (*Jr. Am. Med. Ass.*, Jan. 7) calls attention to a condition of the eyes found in certain children between the ages of 8 and 16, and which he designates anesthesia of the retina. It is found more frequently in girls than in boys, and generally in those who use their eyes a great deal, as in studying. In these cases the vision, both distant and near, falls below normal, often very considerably, and cannot be brought up to normal with glasses. No changes are to be found in the eyeground. A characteristic symptom is the concentric contraction of the field for all colors, but maintaining the proper relation for the different colors.

The treatment is to rest the eyes from near work and give daily applications of a weak constant electric current, one or two milliamperes "voltaic alternations."

BLINDNESS AND OCULOMOTOR PALSIES FROM INJURIES NOT  
INVOLVING THE OPTIC OR OCULOMOTOR NERVES.

Alvin A. Hubbell (*Jr. Am. Med. Ass.*, Jan. 7) reviews the writings of numerous medical men, and records quite a number of his own cases, a study of which leads him to believe that we may have loss of function of the optic and oculomotor nerves, caused by injury or irritation in some other part of the body, particularly in those parts supplied by the fifth, or trifacial, nerve. He holds that in many cases of injury about the face and head, followed by blindness or loss of action of some of the extra-ocular muscles, the possibility, not to say the probability, of the optic or oculomotor nerves being injured, either by laceration, contusion, concussion or extravasation of the blood, is so slight that we must look for some other theory to explain the loss of function, and he is inclined to accept the "reflex theory."



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## ORIGINAL ARTICLES.

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### A CASE OF GUMMA OF THE OPTIC NERVE BEHIND THE PAPILLA AND OF CHOROIDITIS GUMMOSA.\*

BY DR. STOCK, PRIVATE DOCENT.

FROM THE UNIVERSITY EYE CLINIC, FREIBURG, I/B.

(Translated by Adolf Alt, M. D.)

TO diagnosticate a case of lues as a secondary or tertiary one merely from the pathologico-anatomical findings, according to modern knowledge, is no longer permissible. We know that at an early stage even, when in one part of the body infiltrating processes of a secondary nature are present, in other parts destructive necrotic tumor formations, gum-

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\*In the July number of this journal the translator reported a case of gumma of the optic nerve which he thought was the first case of that kind examined microscopically. He has since found that a case of similar nature, though concerning the nerve head and choroid and not, as in his case, the intraorbital nerve, only, and not very far from the chiasm, had been reported in the *Klin. Monatsblætter*. This, he thinks, will be interesting to the readers of this journal, and herewith he offers a translation of the report. The illustration accompanying the German publication, and which is not here reproduced, as far as the nerve is concerned, shows conditions almost identical with those in his case.—ALT.

mata, may form, and that these two forms of lues may co-exist (Lesser<sup>8</sup>, Matzenauer<sup>9</sup>).

It is, therefore, extremely difficult to draw, from an isolated condition in the eye, conclusions as to the age of the luetic infection, especially in the sense of assuming that the presence of destructive gummatous tumors would prove that the infection had taken place a longer time previously than if only infiltrative processes are found. Thus, I should like to report the following case—a gumma of the nerve head and a gummatous choroiditis—from the standpoint that these conditions would prove that the patient suffered from secondary or tertiary lues. This can, however, not be done since no thorough general examination was made, but I wish to emphasize that in the nerve head and the choroid such a general inflammatory necrosis had taken place as we are wont to call gummatous.

It is well known that gummata are found with relative frequency in the iris and ciliary body and I do not intend to go into the literature of these cases, as it is fully reported in Tooke's<sup>10</sup> paper, also by Groenouw<sup>11</sup> and Ewetzky<sup>12</sup>, yet pathologico-anatomical descriptions of luetic changes in the posterior part of the eyeball are comparatively scarce. The object of this paper is to collect similar cases when considering my own one. I found the condition accidentally when examining an eyeball from his Rostock collection, which Professor Axenfeld kindly turned over to me.

*History of the Case.*—L. V., a woman, 58 years of age, came to the University Eye Clinic at Rostock on July 28th, 1901. She had formerly seen well with either eye. She says that she never suffered from any severe general diseases. Eight weeks before her admission the left eye became inflamed, but for a time vision is said to have remained fairly good. Two weeks ago the eye became blind. Since then it has become extremely painful, the pains radiating into the head, she vomited frequently and her general health became very much reduced. First she put compresses on the eye, then a physician prescribed some drops. Neither of these remedies brought ease.

*Stat. praes.*—The right eye is perfectly normal.  $V = 6/6$

to 6/5 with + 1 D. No ophthalmoscopic changes. L. E. Amaurosis. Slight conjunctival and considerable pericorneal injection. Cornea steamy, surface stippled. Aqueous humor slightly opaque; pupil narrow and occluded. Details of iris blurred, iris slightly bulged forward. Ophthalmoscopic examination impossible. T + 2.

In order to relieve the patient's pain the eye was enucleated at once. A 1 per cent. cocaine solution (2 cmm.) was partially injected into Tenon's capsule, partly behind the eyeball and in 4 minutes the operation was finished almost without causing any pain. The conjunctiva was stitched together; the wound healed easily and the patient was discharged on the ninth day.

In viewing the eyeball macroscopically, the nerve is found to be twice the normal size and to appear in the transverse section in part much lighter colored than usual. The specimen was put into Zenker's fluid and after 24 hours hardened in iodine-alkohol of increasing strengths, then embedded in celloidine and cut into sections. These were stained with hæmatoxyline-eosine, van Gieson's stain, carmine and Weigert's elastic fibre stain.

*Microscopical Examination—Cornea.*—The epithelium is well preserved. In some places the cells are separated and gaps appear between them. Bowman's membrane is intact; on one side new-formed connective tissue and bloodvessels grow under it for 0.75 mm. (pannus). The stroma of the cornea is unchanged, nowhere is there an increase in the cells or a formation of vacuoles. Descemet's membrane and endothelium are normal; on the latter lie a few leukocytes. The *anterior chamber* is of normal depth. The contents are perfectly coagulated; they must have contained a large quantity of albumen. There are leukocytes here and there, a larger accumulation lies at the bottom of the anterior chamber. In the anterior surface of the iris and in the pupil red corpuscles are found. The *iris* is throughout somewhat thicker than normal. This thickening is partly due to an œdema and partly to an infiltration with round cells. The pupillary edge is glued to the anterior lens capsule by fibrine. The veins of the iris are normal, but some of the arteries show



proliferation of the endothelium and thickening of the intima. In other parts white and red bloodcells are seen passing through the bloodvessel walls. The *ciliary body* shows more nuclei, but it is otherwise normal. *Retina*. Downwards a fibrinous exudate lies under the retina. This exudate begins about 3 mm. behind the ciliary body and reaches nearly to the papilla. The detachment of the retina caused by it is anteriorly but 1 to 2 mm. high, further back it reaches a height of 4 to 5 mm. The ganglion cell layer contains only a few ganglion cells in the periphery of the retina; in the part of the retina surrounding the papilla for the distance of 1 cm. no ganglion cells can be stained. The nerve fibres, too, are less numerous than normally. Mueller's fibres are not hypertrophied, thus cavities appear between them. Where these lie near bloodvessels, they are partly filled with red blood cells, in the others a few leukocytes and a fibrinous exudate are found. Aside from this diffuse blood infiltration, there are larger hæmorrhages in the retina which press the remaining supporting fibres apart. The outer and inner granular layers are unchanged, except for hæmorrhages here and there. Rods and cones at the periphery are unchanged, but where the exudate detaches the retina they are wanting and in their place lies a homogeneous detritus. The *choroid* in its peripheral parts is slightly thickened, due to œdema and cell infiltration. The bloodvessels are enlarged and gorged with blood. The changes, however, are as nothing compared with the pathological process in the nerve head and the neighboring retina and choroid. The sheaths of the optic nerve merge into the surrounding connective and fat tissue without any sharp outline; it is the same with the sclera. This obliteration of the outlines is due to infiltration and oedema of both these tissues. The infiltration is not uniform, in some places the round cells form larger aggregations. There are, also, a large number of newformed bloodvessels, and between them red blood cells lie in the tissue. The optic nerve sheaths are greatly thickened by numerous round cells being interposed between their lamellæ. They, too, contain newformed bloodvessels. The intervaginal space has almost totally disappeared; its former situation can be recognized

by a line of infiltration with leukocytes. At its end, which lies 5 mm. behind the lamina cribrosa, the optic nerve is  $3\frac{1}{2}$  mm. thick; at 4 mm. behind the lamina its diameter is 4 mm. There is a nodule-like swelling. The center of this nodule lies 4 mm. behind the lamina and during the enucleation its posterior third was left behind.

In this nodule not a normal nerve fibre can be found. Its contents are detritus, that is, masses which stain diffusely and irregularly and in which small nodules are seen to take up more hæmatoxyline, remnants of nuclei. The necrosis passes through the lamina cribrosa to the papilla, in which, also, no normal nuclear stain can be obtained. In the detritus nothing but bloodvessels may as such be recognized, but they, too, are greatly altered. To an extent of 1 mm. around the papilla the retina is, also, destroyed. In its place lies a necrotic tissue traversed here and there by single fibres. Outwards from this region first the outer nuclei begin to take up the stain, then a little further on the inner nuclei, while the ganglion cells and nerve fibres are totally destroyed almost to the periphery of the retina. On the nasal side of the papilla the rods and cones are fairly well preserved, while on the temporal side they are replaced by a fibrinous exudation in which no tissue elements can be detected.

Between the retina and choroid, which is gravely altered where it surrounds the papilla, a coagulated exudate 1 mm. in thickness is situated.

On the nasal side of the papilla the structure of the choroid is destroyed for about 4 mm. In its place lies a mass of detritus, in the centre of which no tissue elements can be seen, while in its periphery some leukocytes and outlines of destroyed bloodvessels can be made out. On the temporal side of the papilla the choroid has about 3 times its normal thickness on account of an enormous round cell infiltration. In spots this infiltration appears denser. This seems to be always around a bloodvessel. In the centre of some of these spots larger epitheloid cells with paler nuclei are seen. Here and there a giant cell is found. Outside of this large focus around the papilla smaller foci of infiltration are found irregularly disseminated in the choroid.



*Bloodvessels.*—From the cut surface of the optic nerve the central artery and vein can be followed forward for about  $2\frac{1}{2}$  mm. into the necrotic parts. Their walls are preserved, yet their tissue cannot be differentiated even with high powers. The nuclei are not stained. Their lumen is filled with a thrombus which consists partly of red blood cells and fibrine in the meshes of which some leukocytes are suspended. In the centre of the nodule an open slit takes the place of these vessels, the walls of which do not differ from the surrounding necrotic tissue. On the other side of the lamina cribrosa the bloodvessels reappear. In the papilla their nuclei do not take up any stain, the bloodvessels are mostly empty, some contain red blood cells or are filled with detritus. At about  $\frac{3}{4}$  or 1 mm. from the edge of the papilla the nuclei in the bloodvessel walls begin to take up some stain, but very poorly so. In the walls and around them in many places red blood cells are seen. These hæmorrhages reach into the depth of the retina between the nuclear layers or they form layers between the nerve fibres. The inflammatory process has destroyed both central artery and vein and the blood supply to the retina must have been totally cut off. From the larger hæmorrhages into the retina it seems that the vein was first obliterated and the artery somewhat later.

Since it was impossible to see the fundus, on account of the opacity of the cornea and the circular synechia with occlusion of the pupil, I should like to reconstruct the probable ophthalmoscopic picture from the pathologico-anatomical conditions. I think the description would be about the following: At the site of the optic nerve entrance somewhat prominent, a grayish-yellow focus is seen in which no details can be recognized. No bloodvessels can be found in the papilla. The outlines of this focus are not sharply defined. Peripherally from it the retinal veins are seen to be gorged with blood and there are numerous hæmorrhages.

This description is taken almost verbally from Schneidemann's<sup>5</sup> paper, who described "a case clinically as a gummatous newformation in the papilla." This author could not prove the correctness of his diagnosis by an anatomical examination, as a vigorous antisyphilitic cure removed the in-



flammation and some vision returned. From this return of vision Schneidemann concludes that the gumma was situated intraocularly and that, in spite of the severe inflammation, the bloodvessels were not totally obliterated.

In our case the centre of the gumma lay behind the lamina cribrosa, the central bloodvessels were not only thrombosed, but their walls had become perfectly necrosed. Therefore, after the retina had been for a prolonged time without blood supply, just as we see it in embolism of the central retinal artery, not even a quick and energetic antisymphilitic treatment could have restored vision.

#### EPICRITICAL REMARKS.

Viewing the pathologico-anatomical picture, we find two separate processes, one in the optic nerve, the other in the choroid. The two processes are similar in that in each of them there is an enormous infiltration around a necrotic centre.

Such necrotic inflammations are found in tuberculosis and syphilis. If there were a tuberculous process in our case, the formation of giant cells and the general tubercular structure would be much more pronounced. As this is not the case the diagnosis must certainly be of a gummatous tumor in the optic nerve behind the papilla with secondary obliteration of the bloodvessels through thrombosis and gumma of the choroid. The very extent of the necrosis and the particular small cell infiltration argue for syphilis.

An intracranial syphilitic affection of the optic nerve of a gummatous character is not so very rare. From Ulthoff's<sup>12</sup> work we know that in the posterior part of the optic nerve, in the chiasm and in the tractus these gummatous processes are relatively frequent, and lead to optic neuritis or choked disc, or to visual troubles without visible signs in the papilla and with descending optic atrophy.

The localization, however, of such a necrotic process in the optic nerve head is very rare. Aside from Schneidemann's clinical description, I can find but two pathologico-anatomical examinations of a similar affection. Juler<sup>6</sup> enucleated the eye of a patient who had acquired lues 6 years

previously, on account of iritis, circular synechia and suspicion of intraocular tumor. There was iritis and diffuse infiltrative choroiditis and optic neuritis. The optic nerve was double the normal size. This thickening was caused by infiltration with round-cells; the papilla, also, was densely infiltrated with leukocytes. Large hæmorrhages in the retina. Nowhere necrosis. Since the other symptoms of this patient were quickly cured by antiluetic treatment, these alterations must, also, be looked upon as luetic in character. Like in our case, there was a dense infiltration of the optic nerve and choroid, and iritis; but there was *no necrosis*. These conditions rather resemble the infiltrative inflammatory processes in the skin.

In the second case, which was published from the Rostock University Eye Clinic (Prof. Peters) by Wagner, the enucleation had, also, been made on account of iritis with circular synechia and secondary glaucoma. When the optic nerve was cut, it was found more resistant than normally and twice as thick. There was a focus of infiltration behind the lamina cribrosa taking up the temporal half of the nerve and about 2 mm. long. In the center of this focus the tissue was necrotic. The larger vessels in the optic nerve show only periarteriitis; their inner surface is normal. In the smaller ones the endothelium is greatly proliferated, in some it obliterates the lumen. There are no circumscribed foci in the choroid, but a diffuse infiltration with round cells. This case shares with mine the focus in the nerve head with central necrosis, also, the iritis, while it lacks specifically luetic changes in the choroid.

Supposing that the eye had been otherwise normal, in Juler's case a restitution by means of an anti-syphilitic cure was possible, while in Wagner's and my cases this was absolutely out of the question. On the other hand, Wagner himself points out that the alterations in his case might be of a secondary character, because the patient had secondary eruptions in other parts of the body. I should not like to exclude this possibility. In our case, however, I think the diagnosis of gumma is the only possible one, for such an extensive necrosis belongs solely to this stage. That Wagner's

patient had secondary symptoms on the body would not argue against my opinion, since the two forms may be found contemporaneous in one individual.

As in our case, Juler<sup>6</sup> found the choroid in the eye enucleated by him, very much thickened and infiltrated in a similar manner. Yet his findings differ very materially from ours by the absence of the necrosis and nuclear death. According to his description there was in his case simply an infiltrative process. In Wagner's case, but a gorged state of the bloodvessels and some infiltration were found in the choroid, but nothing of a specific character could be recognized in this membrane.

There is one more case described in literature in which something similar is said to have been found. However, as Schöbl<sup>1</sup> himself later on stated, it seems that the specimens were mixed up. (It seems to have been an eye with tubercular choroiditis.)

I wish, in this place, to thank Professor Axenfeld, to whom I owe the specimen in my case.

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(From the foregoing interesting paper, it will be seen that, while a gumma in the nerve head has been seen without doubt in two cases only and has probably existed in two more, but without direct proof, and while, according to Uhthoff, intracranial gummata in the chiasm and optic tract are not so very rare, my case of gumma of the optic nerve in its *posterior intraorbital part* still seems to be the only one thus far seen in that locality.—TRANSLATOR.)



AN UNUSUAL FORM OF EXUDATE INTO THE ANTERIOR CHAMBER IN IRIDOCYCLITIS AFTER CATARACT EXTRACTION.

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IN the text-books, it is usual to divide the exudates in iritis and cyclitis broadly into the serous, the plastic, and the purulent, in accordance with the pathological characteristics which are well recognized. There is, however, in addition to these, another form of exudate, much less frequent, known as the "spongy" or "gelatinous," having certain features marking its development and decline which give it an individual distinction and clearly differentiate it from the other forms mentioned.

It is characteristic of this exudate that it occupies the depth of the anterior chamber from the iris to the posterior surface of the cornea, at first filling the entire cavity. Absorption invariably takes place from the corneal periphery towards the center, the mass showing very sharply defined edges which are usually linear and not often curved. This latter characteristic serves to diagnose the mass from a dislocated lens which, in general appearance, it often resembles when it has begun to separate itself from the iris angle. Around the gray mass the iris tissue is usually seen to be of good color and texture. In all the cases of this type I have seen since I reported my first observation in the *Amer. Jour. of Med. Sci.*, January, 1880, the course of the absorption process has been rapid. In from 2 to 3 days after the appearance of the exudate—which is from 2 or 3 days to a week after the onset of the disease—absorption commences and in a few days more—often less than a week—the mass has practically disappeared, only a few spots on the anterior capsule of the lens remaining as an evidence of its passing. The pupil remains usually of good size, especially if a mydriatic has been used early, and the iris tissue itself does not often show such changes in its substance as are observed in the plastic

or purulent forms. It occurs with iritic inflammation of any of the commonly recognized etiologies, as syphilis, rheumatism, trauma (cataract extraction) and gonorrhœa. A typical case of the latter I have but lately had under observation.

Recently, however, I have been able to study a case which, while having many of the characteristic features of this spongy form, had yet such important deviations from the usual course as, it seems to me, make it worthy of being recorded in some detail as a contribution to the further study of this remarkable type of inflammation of the anterior uveal tract.

Mr. T., a German, 61 years of age, was admitted to the Emergency Hospital with a complete cataract of the left eye on April 2nd, 1905. The eye was clear, the anterior chamber good, pupil nicely responsive to light and tension normal.

The operation of simple extraction was done under strictly aseptic conditions on April 3rd. The operation was perfectly smooth, the lens delivered without trouble and the iris returned promptly under a little coaxing. There was only a small amount of soft cortical matter remaining behind. The pupil was central and round when the simple dressing, held in place by adhesive strips, was applied. On the 5th when the dressing was changed the anterior chamber was found to be well filled, pupil central and round, no pain and only a slight bulbar injection. Atropia drops applied. The case progressed normally until the 11th when rather suddenly pain set in and when seen a few hours later there was considerable injection of the ball and some chemosis of the conjunctiva and lids. In addition to the atropia hot applications were applied every 4 hours. These symptoms increased in intensity until the 13th when a small line of gray deposit was observed at the bottom of the anterior chamber. The pupil still remained of medium size but was hazy, anterior chamber rather muddy. Aside from the atropia and hot applications, dionin, 5 per cent, was applied every other day. The exudate, in spite of this treatment increased, until on the 18th it reached the pupil and had the pyramidal form shown in Fig. 1 The subjective symptom of pain had by

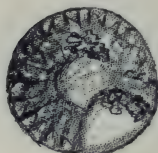


Fig. 1.

this time very much diminished, but the injection of the ball was considerable and lachrymation was profuse. The pupil was still of good size and except at the outer edge was clearly defined. The inner portion of the iris presented a very good surface appearance while the outer portion, next the pupillary opening, was swollen and its rugæ indistinct. At the top and outer edge of the pyramidal mass, and on the iris at its upper portion near the pupil there were fine streaks of blood arranged in an irregular manner. These bore a strong resemblance to bloodvessels, but examination under a magnifier showed them to be extravasated blood lying on the surface. There was now only a slight amount of pain, but the bulbar injection was still marked. The treatment of atropia, hot applications and dionin was continued. In a day or two the mass began to diminish in size from below so that by the 21st it had assumed the shape shown in Fig. 2. The iris tissue at all parts except near the outer edge of the pupil was of quite the normal appearance. It will be seen that the blood streaks had changed both their arrangement and positions. By the 26th the mass had still further reduced its size from below, its edges being sharply defined.

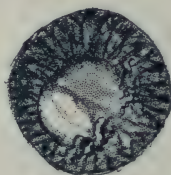


Fig. 2.

The pupillary edge was now quite distinct, except at the outer part, and the blood streaks were more widely diffused over the iritic surface, being especially heavy below and outward, Fig. 3. Fig 4 shows the condition on the



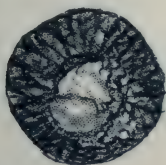


Fig. 3.

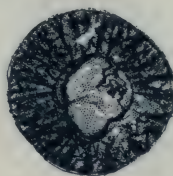


Fig. 4.

28th when the exudate was confined to the pupillary opening with a small cone with sharp edges projecting into the anterior chamber. The streaks of blood were confined to the upper part of the pupil. The outer part of the iris was still clearing. On the 3rd of May the exudate had entirely disappeared except in the pupil itself, Fig. 5, and on this were

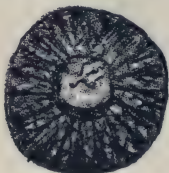


Fig. 5.

three thin streaks of blood. The iris had a perfectly normal appearance except at the outer pupillary edge where it seemed slightly swollen. The pupil as a whole was adherent to the remains of the capsule, but was only slightly smaller than at the onset of the disease. The contraction of the pupillary space continued until, on May 6th, it was as shown in Fig. 6, with two fine blood streaks running vertically

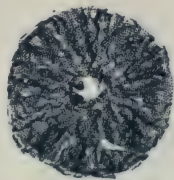


Fig. 6.

down from the iris periphery to the pupillary edge with a small blood streak on the pupillary space itself.

On May 13th there still remained a single streak of blood running down over the iris surface from above. The pupil was still further contracted. Fig. 7. The eye was now free

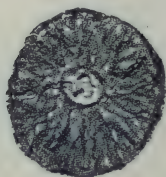


Fig. 7.

from any injection. Tension normal, good projection but only perception of movements.

On June 1st an iridomy was done, the incision, some 5 mm. long, being made with Dr. Wecker's *pincers ciseaux* through the pupil from without inward. The incision opened only to the extent of about 1.5 mm., owing to the thickness and toughness of the exudate back of the iris.

Though great care was taken to prevent it, there was a recrudescence of the irido-cyclitis, but without any mass of exudate as before, beginning on the 5th day after the operation. This subsided in about 2 weeks, leaving a complete closure of the artificial pupil.

On July 11th another attempt was made to secure a permanent artificial opening in the iris, the incision this time being made below the pupil and in what was believed to be a normal part of the iris. No excessive reaction followed this operation and an oval opening some 3 mm. in its largest diameter has remained clear. The vitreous gradually cleared up and the final vision, when the patient was discharged some 3 weeks later, was 5/20, with  $+ 8 \text{ C} + 4 \text{ ax. } 75^\circ$ . It is interesting to note that the astigmatism is according to the rule, quite the contrary to what is usually found after normal cataract extraction where the axis of the correcting plus cylinder, almost without exception, approaches the horizontal. This is the more noteworthy when we know that the cornea before the operation showed, under the ophthalmometric examination, no astigmatism at all. This departure from the customary condition after cataract extraction, I think we can very properly refer to the change in the curve in the cornea brought about by the contraction of the exudate behind the iris in such a manner as to increase the curvature of the vertical meridian.

The foregoing case, I think, falls in its more general characteristics, under the classification of the "spongy" exudates, but there are some points of departure from this form as usually observed which render it worthy of consideration. In every instance I have seen before this one, the exudate has come on with comparative suddenness, the anterior chamber being filled in the course of a few hours, and its disappearance effected in only a few days at most. Here the exudate took place slowly, commencing as an apparently typical hypopyon, which, at first sight, would lead one to fear a suppurative inflammation, and while circumscribed rather indefinitely at the beginning, at no time did it fill the anterior chamber completely. Its later progress, however, was typical of the course of the spongy exudate, though much more chronic in its progress. The disappearance was from the periphery towards the center and the edge of the mass was sharply defined, while the anterior iritic surface had an almost normal appearance. This is the first time I have seen a blood extravasation as a complication of acute inflammation of the anterior portion of the uveal tract with the spongy exudate. I have seen it, however, in the plastic form. On these occasions the quantity of blood has been much greater, filling, in one case, the lower half of the anterior chamber. The shifting character of the blood streaks is also not without its interest.<sup>1</sup> The inflammation, I am inclined to think, was largely in the ciliary body at the upper and outer portion, the exudate being poured through the pupil into the anterior chamber. The iris itself seems to have participated only to a limited extent, if we may judge by the large size of the pupil and general appearance of its surface, maintained up to the time when the contraction of the exudate on the capsule and posterior surface of the iris drew it together. As revealed by the iridomy, the lower portion of the iris was but slightly affected.

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<sup>1</sup> It is very interesting to note, in this connection, that Dr. A. Alt, who was among the first to examine thoroughly this pathological product, considers the spongy exudate to be associated with hæmorrhages into the iris tissue, and even between the lamella of the cornea. See his "*Treatise on Ophthalmology*," 2nd Ed., 1893. p. 147.



## EPIBULBAR PAPILLO-EPITHELIOMA.

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NEOPLASMS upon the globe, whether benign or malignant, are likely to receive some treatment before they have advanced very far. The pain and discomfort they occasion and the remote fear that they may impair or destroy the sight prompt the patient to apply for early relief. In this way papillomata of the caruncle and conjunctiva and epithelial growths of the globe or its appendages are frequently brought at an early stage to the observation of the surgeon. Prompt and radical treatment in many cases suffices to permanently arrest these growths. On the other hand, they are subjected to inefficient treatment; attempts at removal are made without success, and treatment tending rather to stimulate than to destroy them is instituted and so the disease goes on slowly gaining headway. Even after the most judicious surgical interference, these growths will frequently return. It is very difficult to eradicate a papilloma or an epithelioma of the eye or its appendages, unless treatment is begun very early and repeated on the slightest manifestation of a return. In this way we can control the development of a few cases. In the majority this will not be possible, as the tissues around the tumor are so invaded that complete removal is impracticable.

Papillomata not infrequently begin at the limbus and grow both toward the cornea and the conjunctiva. Occasionally they are pedunculated and are successfully removed. Those which we see in the more advanced stages cover the cornea and conjunctiva to a greater or less extent, and it becomes a question when the globe will have to be sacrificed. The remarkable resistance of the sclera and cornea to epibulbar tumors is very well shown in this case. For years the cornea had been covered and yet at a probably only recent date had the tumor invaded the globe. The question

of trauma is always to be considered in epibulbar neoplasms.

Many writers attribute the development of sarcoma to some previous trauma, either accidental or surgical. In this case reported below, there is a history of both an injury and an operation for pterygium. The change in the character of the tumor from papilloma to epithelioma is not unusual.

Dr. J. Herbert Parsons says in his *Pathology of the Eye*, "Papillomata grow outward and do not usually invade the deeper tissues, but there can be no doubt but that they sometimes become malignant."

In this case a very rapid growth of the neoplasm was going on a few weeks previous to the operation, and it was only severe pain which forced him to submit to it.

R. M. A., aet 53, a rather delicate looking man of medium size, gave the following history of his case: At 18 years of age he had on the inner side of the left eye a small growth which he claims at the time was a pterygium. This was accidentally injured by the branch of a tree, causing considerable hæmorrhage. Some time after this a tumor began to develop from the site of the injury, and eight years later it had increased so much in size that there was considerable interference with the upper lid, on closing the eye. The growth was so annoying that he had it removed. He says it was cut off close to the globe, but soon began to grow again more rapidly than ever, and later some vessels going into the tumor were severed. This latter operation seemed to him to have retarded the development of the tumor for a period of several years. For the past three or four years it has been growing very steadily, with, however, a rapid increase in size in the last six weeks. The pain has been severe only at infrequent intervals during the last two years, with a marked increase in the last few weeks coincident with the rapid increase in size. He was first seen October 9, '03, and again on October 28. During this time there was quite a perceptible increase in the size of the tumor, he had suffered from constant pain, and his physical condition was evidently worse than when he first came for consultation. The tumor filled the entire orbit and protruded from it about



Fig. 1. Front view of tumor in situ.



Fig. 3. Bisected tumor—showing the thickness of the growth and the preservation of the shape of the globe.



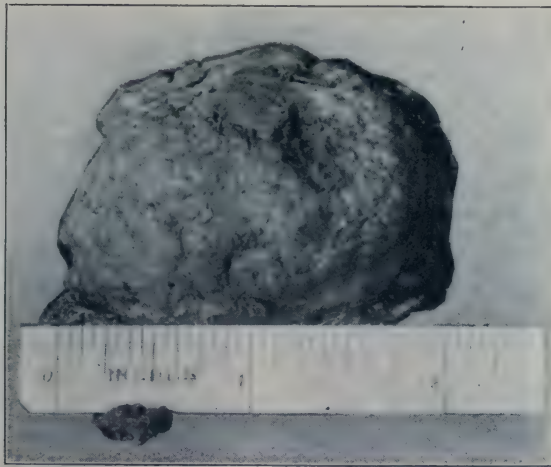


Fig. 2. Longitudinal view of tumor.

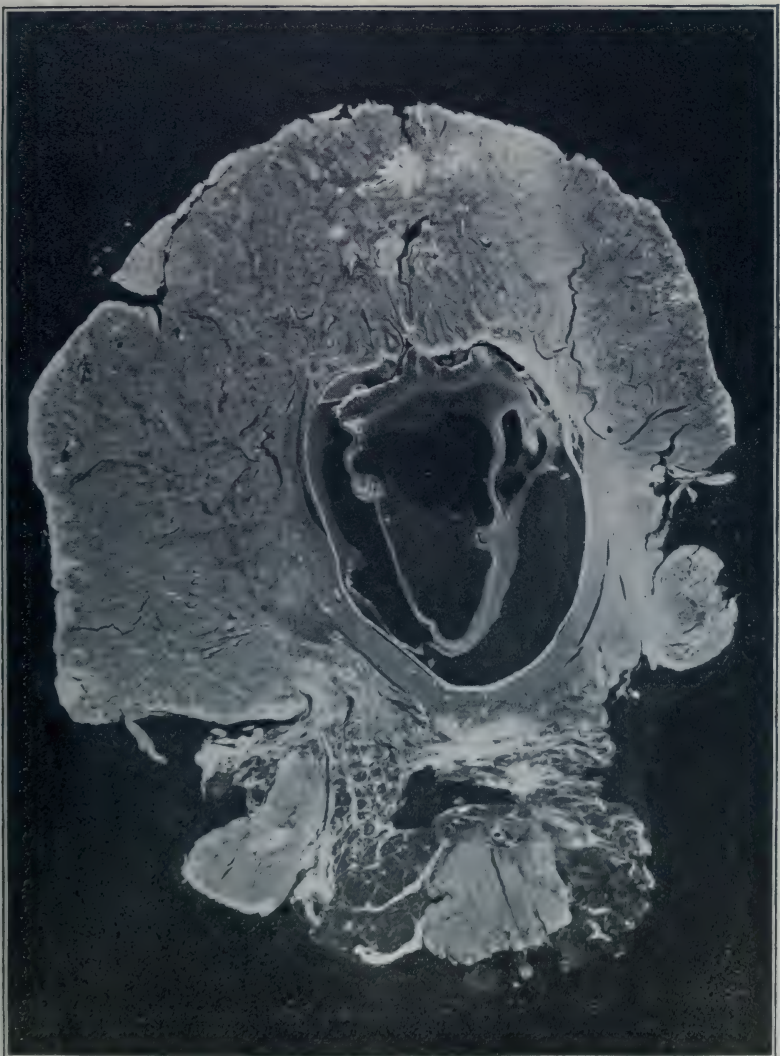


Fig. 4. Photographic enlargement, made direct from microscopic section.

3 $\frac{1}{2}$  cm. The surface was covered by a yellowish scab, which, when removed, presented exuberant granulations of a cauliflower appearance from which oozed a yellowish offensive fluid. He could move the mass from side to side without any apparent pain. The tumor so overlapped the margins of the orbit that the lids could not be seen or felt. In spite of all this he declared he could still see some with the eye (?) and wanted only the tumor removed, but nothing was to be done to the eye. After much hesitation he finally consented to an operation. I began by separating the tumor on the nasal side, cutting close to the orbital wall. As soon as I could introduce my finger, I found I had to deal with a tumor which filled the orbit solidly. By cutting slowly and carefully with a pair of blunt-pointed scissors, I separated the entire mass from the apex. When the final separation was made there was a great gush of blood from a large artery which had supplied the tumor, but it was checked by firmly packing the orbit. The exenteration was as thorough as possible, everything being removed down to the bone. There was no trace of the upper or lower lids as such, though microscopic examination afterwards revealed part of the upper lid involved in the tumor. The edges of the orbit were smoothed over by long continued pressure of the tumor, the lower lid having been absorbed.

*Macroscopic Appearance.*—The tumor was quite firm, its anterior portion was roughened with shallow fissures in it, the lateral portions were smoother and dark in color, posteriorly the optic nerve was seen to have been cut off far back, and a part of the sclera could be traced into the tumor mass. Before cutting the tumor open, it was a question whether anything was left of the globe and its contents, or whether it had been only superficially invaded.

Behind the tumor were found the ocular muscles, very much hypertrophied, and orbital fat which was reddish brown in color. A transverse section through the tumor and the centre of the optic nerve discovered the globe as seen in the accompanying photograph, almost completely surrounded by the tumor, but remarkably well preserved in shape, and showing on examination an invasion only of its anterior portion, espe-

cially the cornea and sclero-corneal zone. The tumor was light in color, almost white, not very vascular, and the cut surface presented an arborescent appearance characteristic of papillomata. The upper and anterior portions of the growth, after hardening and preparation for mounting, were 1.5 cm. in thickness, while the lower portion was 1 cm. The globe was somewhat elongated from the lateral pressure, but the very slight change in its shape is remarkable. The contents of the globe were much disorganized, the vitreous was liquified, the retina partially detached in places and nothing was to be seen of the lens, cornea or iris except small disorganized traces of tissue and pigment, which without the microscope, could not positively be identified as belonging to any particular tissue.

*Microscopic Appearance.*—The tumor which at first was evidently of a purely papillomatous nature, had its origin at the sclero-corneal junction on the nasal side, spreading gradually over the whole of the cornea, and involving the entire bulbar conjunctiva. Little remained of the corneal tissue, though it is possible to trace the membrane of Descemet extending forward into the tumor. The iris is markedly altered, while the ciliary body appears to have resisted invasion and is quite well preserved. The lens also seems to have been almost completely absorbed, though traces made of it may be seen in some sections. The sclera, except at the corneal junction, has been resistant and is unaltered. The upper eyelid, a portion of which was involved in the growth, shows extensive round-cell formation, a congestion of vessels and thickening of the sub-conjunctival tissue, as it extends around the fornix. To the nasal side the tumor is purely papillomatous, but the upper and outer sides assume the appearance of a mixed growth. The surface of the tumor shows in places a marked and characteristic down growth of epithelium in columns and fingers, quite characteristic of epithelioma; this gives the appearance of columns of epithelial cells, with fibrous connective tissue between them, giving therefore a mixed picture, including the characteristics of both papilloma and carcinoma. As the tumor only shows the malignant character in the upper and outer portions,



and as it was in this part that the rapid growth took place during the last three months, during which time the pain was more severe than at any previous period, it is reasonable to assume that it was during only the last three months, that it took on a malignant form, and that during the previous seventeen or eighteen years, it was a benign growth of a papillomatous nature. The recovery from the operation was uninterrupted — and reports more than a year afterward showed that there had been no return and that a complete cure was probably assured.

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## REVIEW.

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### OPHTHALMIC YEAR BOOK FOR 1905.

In preparing the second volume of this work, the authors, Dr. Edward Jackson and Dr. George E. de Schweinitz, have given us, in condensed form, the pith of the most valuable articles contributed to the literature of ophthalmology during the last year, and also a list of books, monographs and journal articles pertaining to the subject.

They have abstracted a large number of articles and have indexed one hundred and fifty-eight books and monographs, and about thirteen hundred and fifty journal articles, contributed by nearly eight hundred and fifty writers.

The body of the book contains two hundred and fifty pages, Dr. Jackson preparing the articles on Eye Strain, Refraction, Ocular Movements, Diseases of the Retina, Optic Nerve, Tracts and Centers, Crystalline Lens, Vitreous, Lacrimal Apparatus, Lids, Orbit, Adjoining Sinuses, and general Ophthalmology. Dr. de Schweinitz prepared the articles on diseases of the Conjunctiva, Cornea, Sclera, the Pupil and Uveal Tract, Toxic Amblyopias, Glaucoma, Tumors, Injuries, Sympathetic Diseases and Operations.

Much labor has been expended in its preparation and it gives the ophthalmologist the opportunity to quickly gain possession of the most important new facts bearing upon his professional work.

## MEDICAL SOCIETIES.

### OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

JOHN TWEEDY, F. R. C. S., President in the Chair.

*Thursday, June 8th, 1905.*

#### CRIBRIFORM CHOROIDO-RETINITIS.

MESSRS. R. W. DOYNE AND SYDNEY STEPHENSON read a paper on cribriform choroido-retinitis, a rare form of fundus disease. They described 3 cases in adult patients of a peculiar clinical type of choroido-retinitis, characterized by large sheets of white exudation lying in the fundus beneath the retinal vessels, and showing few or many round or oval holes, through which the color and markings of the underlying choroid could be recognized. In some instances the holes might be filled with pigment. There were grounds for thinking that the affection had resulted from acquired syphilis. The authors rejected the view that the condition of the fundus was the outcome of the metamorphosis of copious hæmorrhages.

#### OPTIC NEURITIS.

MR. LESLIE PATON read a paper on the course of optic neuritis and its subsidence after operation in cases of cerebral tumors, and in it he analyzed a series of 105 cases which had occurred at the National Hospital during 1903 and 1904. Of these cases there were 30 in which it was possible to examine more or less fully the eye condition after operation, and these cases fell into four groups as regards vision: (1) There were 8 cases in which the vision was little if at all impaired. (2) In 11 cases the patients were blind or almost blind before the operation, and afterwards their vision recovered, in some even up to normal acuteness of sight. In Group 3 were those cases which were practically blind at the

time of the operation and which regained no vision (6 cases), and also those in which the vision failed markedly in spite of the operation (2 cases), giving a total of 8 cases out of 30 operated upon which did not save the sight. In Group 4 were three cases in which one eye retained good vision while the other became blind or nearly so. A notable symptom in these cases was attacks of transient dimness of vision, which occurred most frequently in the cerebellar cases, and were most probably dependent upon interference with the vascular supply of the occipital lobes. In different cases the optic neuritis showed different appearances, and the cerebellar cases showed more swelling of the disc than did those in which the tumor was situated in the frontal or parietal lobes, while macular changes appeared only in a small number of cases, and even when these were present they were not necessarily associated with any interference of vision; this was in favor of the changes being superficial. The intradural tension was in all cases high. The swelling of the disc subsided gradually, but more rapidly in cystic cases, while in those which led to blindness the disc assumed a paper-white appearance, with arteries much diminished in size. In some cases where the sight was retained the disc had usually a muddy greyish-pink appearance, but this tended to disappear, and in some of the cases it was impossible to tell from the appearance of the disc that there ever had been optic neuritis at all; this was so in one case where there had been extensive macular changes, but the vision recovered to 6/6.

#### RING SARCOMA.

MR. L. WERNER (Dublin) described the case of a boy, aged 18, the sight of whose right eye had been failing for nine months before being seen, while black spots had been lately observed upon the iris. When seen the iris was covered with coal-black spots of pigment, less marked above, and in addition there was a small brown tumor wedged into the angle of the anterior chamber at the outer side. The anterior chamber was deep, although the tension was high, and there was a deep glaucoma cup; the vision was "hand-movement" only. The eye was enucleated, and the patient



remained in good health one and a half years after the operation. The tumor was a spindle cell melanotic sarcoma, which affected the ciliary body, and the neighboring parts were infiltrated with pigment cells, which extended into the canal of Schlemm. Black cells extended into the angle of the anterior chamber, and a large number of detached cells were lying loose at the bottom. The case was a typical example of a ring sarcoma, of which about seven cases had previously been recorded.

MR. CANT (Jerusalem) read a paper on the treatment of ophthalmia in Palestine, where he showed that nitrate of silver was commonly used, both by qualified and unqualified practitioners, in solutions as high as 20 per cent. These exceedingly strong solutions were productive of a great deal of injury to the eyes, lids, and conjunctiva, and favored, rather than retarded, the development of organisms. He urged that it was never advisable to use a stronger solution than 20 gr. to the ounce, and seldom should one go beyond 15 gr., or 3 per cent., while a 2 per cent. solution was the most useful strength for the majority of cases.

#### VISUAL EFFICIENCY.

DR. G. A. BERRY read a paper on visual efficiency from the point of view of indemnification after injury. He pointed out that it was impossible, having regard to the different value of good eyesight to different individuals, to formulate an invariable scale of efficiency, and suggested that, on the basis of certain statistics which could probably easily be got, a scale possessing a certain elasticity might be established. The first thing to determine was the degree of vision in one eye alone which just corresponded, for any particular employment, to a complete loss of efficiency. The second was the average loss for different occupations in efficiency, caused by complete loss of vision in one eye alone, the other having full vision. The total efficiency, taking the vision of both eyes into account, was then discussed as a particular function of the separate efficiencies of each eye.

PRELIMINARY PROGRAMME OF THE 10TH ANNUAL  
MEETING OF THE AMERICAN ACADEMY OF  
OPHTHALMOLOGY AND OTOLAR-  
YNGOLOGY.

The 10th annual meeting of what was formerly the Western Ophthalmological and Oto-Laryngological Society, will be held at the Lenox Hotel, Buffalo, N. Y., on September 14th, 15th and 16th.

Nearly all the railroads have granted special rates on the certificate plan.

The following is the preliminary program:

Address by the President, Dr. W. H. Loeb, St. Louis, Mo.

Address by the 1st Vicepresident, Dr. D. T. Vail, Cincinnati, O.

Lantern Demonstration of the Ocular Fundus of Various Mammals, by Dr. C. A. Wood, Chicago, Ill.

Pinguecula and Pterygium, with Lantern Demonstration, by Dr. A. Alt, St. Louis, Mo.

Dr. T. Faith, Chicago, Ill. Interstitial Keratitis Excited by Traumatism.

Dr. F. Valk, New York, N. Y. Dextrophia.

Dr. E. J. Bernstein, New York, N. Y. Advancement versus Tenotomy.

Dr. L. Howe, Buffalo, N. Y. Clinical Measurement of Torsion with Convergence.

Dr. J. E. Weeks, New York, N. Y. Diabetic Myopia.

Dr. J. E. Willetts, Pittsburg, Pa. Fixed Falacies.

Dr. G. F. Keiper, Lafayette, Ind. Bacteriology of Dendritic Keratitis.

Dr. W. F. Mittendorf, New York, N. Y. Advancement of Tenon's Capsule in Marked Cases of Divergent Squint.

Dr. W. Gamble, Chicago, Ill. Report of a Case of Tubercular Iritis.

Dr. D. D. Greene, Dayton, O. Some of the Accidents and Complications Met With in the Extraction of Cataract.

Dr. E. B. Heckel, Pittsburg, Pa. Report of a Case of Ophthalmia.

Dr. K. K. Wheelock, Fort Wayne, Ind. Ocular Changes in the Child Before Puberty.

Dr. C. Barck, St. Louis, Mo. Upon Treatment or Dressing After Intraocular Operations.

Dr. G. M. Gould, Philadelphia, Pa. A Study of Failures in Ophthalmic Practice.

Dr. L. R. Culbertson, Zanesville, O. Report of a Case of Quinine Amaurosis.

Dr. Th. B. Schneidemann, Philadelphia, Pa. Spontaneous Hemorrhage Into the Vitreous Body.

Dr. E. Jackson, Denver, Colo. The Mechanism of Accommodation and Astigmatic Accommodation.

Dr. N. Black, Milwaukee, Wis. Advantages and Disadvantages of Glasses in Railway Service.

Dr. L. A. W. Allemann, Brooklyn, N. Y. The Teaching of Ophthalmology in Undergraduate Medical Schools.

Dr. A. C. Wood, Chicago, Ill. Migraine.

Dr. J. A. Spaulding, Portland, Me. The Relations Between Medical Practitioners and the Specialist in Eye Diseases.

Dr. F. Buller, Montreal, Can. Address on Ophthalmology.

Dr. D. T. Vail, Cincinnati, O. Filaria Loa.

Further papers have been promised by Drs. E. Colburn, Chicago, T. Woodruff, Chicago, and Wendell Reber, Philadelphia.



## ABSTRACTS FROM MEDICAL LITERATURE.

BY W. A. SHOEMAKER, M. D.

ST. LOUIS, MO.

## SUBNORMAL ACCOMMODATION AND PREMATURE PRESBYOPIA.

Geo. M. Gould (*American Medicine*, Jan. 21) gives an epitome of 27 cases in whom the accommodation was subnormal and was the cause of marked symptoms. From these data he suggests that:

1. Subnormal, paretic, or insufficient accommodation, or premature presbyopia, even paralysis of the accommodation, of a functional or reflex nature, not dependent upon organic disease, exists in a certain, probably much larger than suspected, proportion of young or middle-aged persons.

2. The youngest of my patients was 20, the oldest 50. several cases show that the subnormal accommodation existed during adolescence. That 18 were women and 9 men has only the significance that women are more subject to eye-strain than men, because they do more near work with the eyes, are less resistant, etc.

3. It is usually permanent or ingravescent, although there was complete recovery in one of my cases.

4. It may be caused by such degrees and kinds of ametropia as compel the renunciation of the accommodation function, especially high hyperopia or astigmatism, etc.; mon-ocularity; glare of footlights; the use of magnifying glasses in engraving, etc.; long-continued abuse of the eyes; a direct inhibiting reflex to the accommodation mechanism. It will be noticed that 17 of my patients had unsymmetric astigmatism, and most of the others an ametropia or anisometropia unconquerable by the visual mechanism. In many cases there may be no discoverable or pathologic cause, the determining factor being a personal and physiological peculiarity. We are prone to forget that presbyopia really begins with the beginning of life, as the recession of the near-point commences in infancy, and

is continuous throughout life up to the age of 60 or more. In the normal progress, and when uncomplicated by ametropia, this recession, at about 45, reaches a degree which makes reading wearying at 14 inches with ordinary-sized type, because the book and writing cannot be held further away; because the letters are so small, and because the macular image is too minute. If our arms were five feet long and our printers used type about a third inch in height, all might get on without presbyopic glasses. The crystalline lens of the eye loses its inherited and high elasticity with each year of life. As it has no neurologic connection with the brain, and is not nourished by red blood-corpuscles, this loss of elasticity is most natural. It is consequently as natural and inevitable that its inherited and primary elasticity should differ in different individuals and that local ocular and also systemic disease and denutrition, eyestrain, etc., should still further make the ingravescient inelasticity of varying degrees of progress. The resultant symptoms will depend upon the amount and morbidity of the near-work demanded of the accommodation. The number of those under 45 with sub-normal accommodation is thus probably much higher than supposed and this fact gives us the suggestion to be constantly upon our guard as to its presence.

5. It is of all degrees and varieties, and may even differ in amount in the two eyes.

6. It may complicate the condition of head tilting, torticollis, etc., with secondary spinal curvature, due to a peculiar axis of astigmatism in the dominant eye. The pathogenic results of dextrocularity and sinistrocularity should not be forgotten.

7. The pathognomonic symptoms are the persistence of common eyestrain reflexes (such as migraine, headache, indigestion, intestinal fermentation, constipation, nervous disorders, dermatoses, etc.) after proper correction of the ametropia and muscle imbalance, and especially an inability to carry on continuous near-work.

8. The diagnosis is impossible by any of the ordinary tests. The loss of power has come on so slowly or has been so long present that the patients have no suspicion that the print is

not clear, and it is usually possible for them to read even the finest letters with ease, and for a short time. The comparative rarity of the cases also throws the oculist off his guard, and routine begets carelessness. Abnormally wide pupils of one or both eyes, the demand of high corrections for distant vision, certain occupations, certain forms of ametropia and anisometropia, high heterophoria, unrelieved reflexes, photophobia, etc., are suggestions that there may be accommodation weakness.

9. It is an active cause of heterophoria, adding to the proof of the common dependence of muscle imbalance upon ametropic and optical causes. It is therefore an added demonstration, if it were needed, of the mistake of the tenotomists who operate for heterophoria. In the vast majority of cases, heterophoria is ametropic in origin, innervational in nature, and is an effort of nature to lessen eyestrain. The results of operation are therefore evil, and make the cure more difficult by physiologic methods.

10. The treatment is by means of bifocal spectacles which accurately neutralize the error of refraction for distant, and the deficiency in accommodational power for near-vision. As in all treatment whatsoever, success here also depends upon the amount of irreparable damage done before the appropriate therapeutic measure is found. Usually relief is sudden and striking. Whatever of usefulness there is in the nonsensical "fogging system" is explained by the fact of incorrect refraction and subnormal or paretic accommodation.

#### EYESTRAIN, ITS IMPORTANCE AND ITS LIMITATIONS.

G. L. Walton (*Boston Med. and Surg. Jour.*, June 22) reports the results of inquiries he made (as to whether they suffered with headache or not) of one hundred healthy persons with sight, and forty-two patients either totally or partially blind. He submits the following conclusions:

1. Among individuals totally blind since infancy, 66 per cent. were free from tendency to headache, as contrasted with 31 per cent. of those having sight, and 29 per cent. of those with partial or with acquired blindness.



2. If these figures should prove constant the inference would seem justifiable that half the headaches in health are due to eyestrain.

3. The headache, when present among those totally blind since infancy, partook sufficiently often of the migrainoid character to preclude the supposition that all migraine is due to eyestrain.

4. The results of this study would indicate that while migraine and migrainoid headaches have a constitutional basis, and while other factors than eyestrain may act as exciting causes, still eyestrain is one of the most, if not the most, important of these exciting causes, and steps for its relief are imperative.

5. In no case has correction of refraction been given a thorough trial until (a) the glasses are properly centered, (b) their continued readjustment is practiced, (c) the patient looks as much as possible through their centers instead of from side to side, (d) efforts are avoided at straining the eyes to see distant objects with the glasses, (e) spectacles instead of eyeglasses are used, and (f) the use of spectacles is constant, not intermittent.

6. The constitutional headache of the deviate is probably allied to the headache of "brain fag," but is out of all proportion to the sources of fag. Little can here be expected of spectacles.

7. In the proportion in which obsessive tendencies and other signs of constitutional peculiarity accompany errors of refraction, efforts at the correction of refraction will prove unavailing for the relief of nervous symptoms.

## BOOK REVIEWS.

TUMORS OF THE CEREBELLUM. *By Drs. Ch. K. Mills, Ch. H. Frazier, G. E. de Schweinitz, T. H. Weisenburg and Ed. Lodholz. New York, 1905. A. R. Elliott Publishing Co.*

This neat volume contains the reprints of interesting papers by several authors from the *N. Y. Medical Journal* and *Philadelphia Medical Journal*. The very interesting subject of cerebellar tumors is presented from different standpoints. We feel like especially pointing out the ophthalmic article, although they are all of them worth studying. Good and serviceable illustrations are found in considerable numbers.

OPHTHALMIC NEURO-MYOLOGY. *A study of the normal and abnormal actions of the muscles from the brain side of the question. By G. C. Savage, M. D. Thirty-one full page plates and twelve illustrative figures. Published by the Author, 137 Eighth Ave. North, Nashville, Tenn.*

The author, whose work on ophthalmic myology is well known, in the present volume formulates a hypothesis by means of which the actions of the muscles of the eye, and their anomalies, may be more easily understood than has been the case heretofore. Surely he has shown great ingenuity in this and his book will be a great help to the student, and we hope that his assertion that, "if this hypothesis accounts for every phenomenon connected with the normal and abnormal actions of the ocular muscles, as it seems to do, it ceases to be an hypothesis and becomes a scientific fact," will to his satisfaction prove true and unversally acceptable.

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# THE AMERICAN JOURNAL OF OPHTHALMOLOGY.

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## ORIGINAL ARTICLES.

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### VICE-PRESIDENT'S ADDRESS.\*

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#### EXPERT TESTIMONY AS IT RELATES TO OPHTHALMOLOGY.

BY DERRICK T. VAIL, M.D.,  
CINCINNATI.

*Mr. President and Fellow Members:*

Expert ocular testimony implies, in the first place, an accurate and detailed knowledge of the science of ophthalmology, coupled with abundant practical experience, and in the second place a complete understanding of the plaintiff's ocular condition.

For an expert to diagnose and treat an ophthalmic case in routine practice entails only a moderate amount of time, for much of the tedious work, such as taking the visual fields, testing the ocular muscles, etc., is well done by trained assistants under his supervision; but the examination of a case with a view of furnishing evidence entails the expenditure of a great deal more time on the part of the oculist himself, for the clinical reports furnished by assistants amount to only hearsay evidence and will not be admitted. It is therefore our duty to conduct this examination person-

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\*Read at the 10th annual meeting of the American Academy of Ophthalmology and Oto-Laryngology, Buffalo, Sept. 14th to 16th.



ally and with consummate care. We may be asked while on the stand to state the details of our examination step by step. This is done in order to find if some detail has been neglected. The hurried and incomplete examination of the plaintiff's eyes is sure to be exposed in glaring exaggeration before the jury to the detriment of the expert.

The habit of examining a case in a cursory manner is apt to lead to a wrong diagnosis, and even an expert of undoubted ability will be led to honestly testify to a false state of affairs. To illustrate: A man brought suit against a railroad company to secure damages for alleged personal injury, the result of an accident which he claimed was due to the company's negligence. He claimed his vision was injured, paralytic ptosis present, and that there were other signs of oncoming blindness. An expert oculist substantiated his claim on the witness stand.

Another oculist, not knowing about this evidence, testified that the impairment of vision was due to a slight pannus, and that the ptosis was entirely inflammatory; both being due to chronic trachoma, which was present and which must have existed many years prior to the accident. The former oculist was led to testify falsely because he had evidently *failed to evert the upper lid* in his examination of the eyes.

We should make it a rule to examine every tissue in its natural turn before going on the stand to testify. The frequency with which malingery exists in the cases of personal damage suits should put us on our guard. An element of exaggeration of symptoms exists in many of the ophthalmic cases which come to us for treatment, but in the personal injury cases it is usually much greater.

There is no class of cases which calls for greater perception and skill in diagnosis than these cases of simulation. In many of the cases of marked exaggeration of symptoms, there exists a real injury, of slight significance perhaps, and it is just to allow the plaintiff the benefit of an admission that the injury exists and an honest statement of what it amounts to.

Excellent works on visual economics are to be had, wherein we find working formulæ for estimating the amount of pecuniary compensation which is just in nearly every case.

In the cases I have been called on to testify, my opinion regarding pecuniary compensation was not asked. I have thought that the reason was that that was the province of the jury to decide.

I wish now to speak of some of the disagreeable features connected with expert testimony. One is that if you have distinguished yourself on the witness stand as an expert, you are apt to be called to testify in all sorts of ophthalmic cases. This will result in positive injury to your reputation. You stand in danger of being considered a court hanger-on, and are judged ready to serve as an ideal witness on whichever side engages your services first. This is a disagreeable feature, being absolutely unjust.

Another disagreeable feature is that your evidence may run entirely counter to the interests of the side employing your services, and as you must look to the party subpoenaing you for your fee as an expert, you feel diffident about pocketing the man's money after testifying against him. If the court would but order the examination, and pay for it out of the court costs, it would do away with this unpleasant feeling.

Another disagreeable feature that occasionally arises, is that some one of your colleagues has been summoned on the other side and has given testimony the exact opposite of yours. In such a case you may be asked your opinion regarding him and how he stands in the profession. You take pleasure in lauding your confrère, but in so doing depreciate your own testimony and appreciate his. Your duty is to speak well of anyone who is in good standing in the profession, even if your own testimony must suffer. This is sometimes, though rarely, a disagreeable feature.

In giving your testimony you should use language comprehensible to the most illiterate jurymen, and your answers to questions should be short, unequivocal, honest and frank. There should be no attempt to display knowledge or skill; the short, plain and polite answer to a question is the best passport to the good opinion of the court and jury. An expert who has made a thorough examination and has learned the exact ocular condition of the plaintiff has nothing to fear from cunning or pugnacious lawyers.

Sometimes an expert is called on to explain or elucidate ophthalmic matters. He does not testify regarding the plaintiff, for he has not examined him, and yet the hypothetical questions which are asked bear directly on the case before the jury. It is best to regard the hypothetical question in a broad sense, for by so doing the answer will be qualified to meet any exigency which may arise in the cross-examination. Occasionally you will be gratified to see that your testimony has given satisfaction to both plaintiff and defendant. In such a case I was once doubly gratified, for I received a fee for expert testimony from each side.

And finally, I would say a word regarding a fourth party which is involved in every case. So far I have referred to but three interested parties, viz.: the Expert, the Court of Justice and the Contestants at Law. There is a fourth—our Great Specialty. Every expert is regarded as an exponent. See to it that you bear yourself in such a way as to incite honor and respect for Ophthalmology.

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## THE LENS-CAPSULE IN THE OPERATION OF CATARACT.\*

By HERMANN KNAPP, M.D.

NEW YORK.

THREE recent publications have determined me to accept your president's invitation to read a paper before the Academy of Ophthalmology and Oto-Laryngology. The first is a remarkable and important discussion on "Capsular Complications After Cataract Extractions," at the Ophthalmic Section of the British Medical Association, August 26, 1905, in the *British Medical Journal*, p. 433. The discussion was introduced by E. Treacher Collins. The Journal has only an abstract of the paper, which deals with the difficulties that are caused through the lens capsule, under two heads:

I, *By entering into the section wound*, where it retards the closure of the wound and induces the most deleterious consequences, first causing an uneven, irritable scar, which draws

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\*Read at the 10th annual meeting of the American Academy of Ophthalmology and Oto-Laryngology, Buffalo, Sept. 14th to 16th.



the iris into its proliferating intumescence, develops into kerato-irido-cyclitis, and finally into a chronic sero-plastic uveitis, ending not only in the blindness of the operated eye, but also of the other by sympathetic ophthalmitis;

## II. By opacifying in loco.

Mr. Collins grounded his remarks on specimens of three cases of severe irido-cyclitis, of which two had degenerated into sympathetic inflammations of the fellow eye. In all three cases the sections showed thickening of the sclera-corneal tissue in the vicinity of the wound by infiltration with round-cell exudate. The conjunctival flap was elevated, due to the cell infiltration beneath it, and there was a large accumulation of cells surrounding the entire capsule, with some giant cells.

The simple agglutination of the capsule into the wound is frequent and produces only a mild irritation with slight thickening of its site. It may cause glaucoma by drawing the iris forward, and occupying the angle. In almost all cases of combined extraction, adhesions of the iris stump to the scar have been found in the eyes that have been examined under the microscope (O. Becker). These adhesions drag also the adjacent apices of the ciliary processes into the common scar, —a swampy gutter, filled with pabulum for those foulest parasites so eagerly hunted and never caught.

*How is this condition to be avoided, if it cannot be cured?* It is well known—and the late professor Arlt, one of the best known cataract operators, told me so forty years ago—that sympathetic ophthalmia is much rarer in simple flap operations than in Graefe's method. I can confirm this. When I made the old flap extraction I lost cases by infection, but none that drew the fellow eye into this awful calamity. During my practice in New York I remember two cases of loss by sympathetic irido-choroiditis after Graefe's operation. One has remained vividly in my memory because the most unfortunate consequences followed the operation. At that time I made a miscellaneous division of the centre of the capsule, "scratching," say our fellow eye surgeons on the other side of the ocean. There were little cataract remnants, capsule shreds, and probably also some iris in one small deposit near one of the angles of the section. The old gentleman, gouty and debilitated, suffered a great deal. He was visited daily

by his wife and daughter, who were much distressed. I treated him very carefully. He was a good patient, and was six to eight weeks in the hospital; but when he felt certain that he would remain blind in both eyes, he drowned himself in his bath tub. Since I have adopted the method of opening the capsule peripherically, and parallel to the corneal section, and omitting the iridectomy, I have not seen a trace of sympathetic ophthalmia.

When this peripheral opening is correctly done, I have prolapses of the iris, which I cut as soon as I see them—that is, the day after the night in which they occur. This is mostly in the first night. If a prolapse is cut before any agglutination has taken place, the coloboma is easy and clean. The other methods of opening the capsule do not give so much protection from incarceration.

Allow me to discuss these other modes of opening the capsule. Two years ago Major Herbert, eye surgeon in Bombay, came out with a very useful little book on the technique of extraction of cataract. He criticised my peripheric splitting. He made light of it, saying that this splitting at the upper border of the lens behind the iris, where we cannot see what we do and the lens will escape only with great difficulty, condemns it at once. I reviewed his book and recommended it earnestly and heartily, because it contains many very practical hints and advices, rules which the orthodox text-books ignore. In cataract operation, the least technical trifle that serves a point ever so small should be duly appreciated. In my review of Major Herbert's monograph, with all the just praise, I had to take exception to his manner of opening the capsule, which is by a vertical slit from the lower point of the dilated pupil to the upper. This is the capsule opening I knew long ago. I do not criticise it by deductive argument, but by dry and hard experience. Von Graefe, my teacher, did that splitting during my studies in his hospital. At that time I was not quite a tyro in ophthalmology; among my apprenticeships I could count a year in London at the old Moorefields with Bowman, Critchett, and others, where I seldom missed a day.

The vertical splitting is unfavorable for the exit of the lens; the horizontal, parallel to the corneal section, offers its

easiest escape. The iris is no appreciative hindrance. The next and worst drawback of the vertical splitting is that it produces a more or less dense scar, which is much in the way of the light and which is very unpleasant to divide by a later capsulotomy. Graefe made not only a vertical split in the capsule, but also a horizontal one at the periphery of the coloboma.

He opened the capsule horizontally in the upper part with a cystotome, which he then turned and with it ripped the capsule from below upward to meet the horizontal incision. In this way he obtained a broad, T-shaped opening, which did not always remain large enough, and my imitation of this procedure in Heidelberg and New York proved no more obliging. The peripheric single opening leaves a fine scar near the upper margin of the capsule. The latter is left intact in all the other parts, and is most favorable for a secondary splitting with a sharp, well proportioned knife-needle. The opening crucial or T-shaped, remains almost always permanent. Every now and then some of my patients who have been operated that way fifteen to twenty-five years ago, come to show me their eyes. They are ideal, i. e., no disfigurement at all, clear, black pupil, T and S normal, and the patients say they never have any trouble with their sight.

Let me still consider two other modes of opening the capsule. The older one is to "scratch" the centre of the anterior capsule in different directions with a cystotome, curved needle, or fine hook. This was the general method of Arlt, in Vienna, and many others 40 to 75 years ago, and it is still practiced by many competent operators. Years ago I went through the eye clinic in Vienna, where Prof. Arlt showed me one of his patients. He had often been in my clinic at Heidelberg, and at times he performed some cataract extractions when he was asked by the members of the German Ophthalmic Society at the yearly conventions.

I showed him cases with peripheric capsule opening, and told him that this was a feature of the cataract operation, because it was almost always free from synechiæ. He said he had none either after central and miscellaneous discision. I expressed my doubt. He said, "I shall convince you if you come to Vienna again." It was not long after that I



went to Vienna, and he showed me all the cases operated and asked me to inspect the pupils with oblique light myself. I did so and told him: "There is no free pupil; all have fine adhesions." "Oh, yes," he replied; "those are delicate agglutinations, not inflammatory products. They do not impair the sight, and signify nothing." I soon detected the cause of these innocent agglutinations. In watching the passage of the cataract through the narrow pupillary area, I saw small ruptures at the border of the pupil. They were little angular ruptures, well visible so long as the white lens was their background; as soon as the lens is out they contract and cannot be seen any more. In some eyes there are no adhesions, but many show the small synechiæ. Their creation, so far as I can explain it, is as follows: When the capsule is ruptured miscellaneously its small shreds come in contact with the tiny, irregular ruptures of the iris and agglutinate. When the capsule is incised away from any rupture of the sphincter portion of the lens, the two wounds do not meet, but close separately. When in a month or later the capsule is discinded with the knife-needle, the shreds of the capsule do not touch a ruptured place, and the pupil remains with very few or no synechiæ, constituting an ideal pupil.

The next mode of opening the capsule is to tear a central leaflet from the anterior capsule. This mode is very commendable. About five years ago, on a journey from Egypt to Vienna, I stopped in Buda-Pesth and visited the University Eyeclinic, which at the time was in the care of Professor Schuleck. I knew from his publications and hearsay that he was an excellent operator. In the hospital were about a dozen patients operated for cataract. Schuleck showed me all, let me examine them myself, and he operated, by Graefe's combined extraction, two patients before me. The operations were without accident, and the patients previously operated on were in the best way of recovery. This mode of removing cataracts is very commendable.

When the combined extraction had become popular, and I had in Heidelberg a fairly large opportunity of operating cataracts, I saw that the capsule was the most difficult factor in the cataract operation. In one of the periodical statistical

reports of my cataract operations, I said: "The man who invents a safe method of removing the central part of the anterior capsule will be the greatest benefactor of the hosts of countless old blind people." If in the combined operation the capsule is removed, success is almost certain, provided there are no complications on the part of the eye and no coarse technical faults. Yet there are also difficulties in the removal of the central part of the anterior capsule. It is mostly done with a capsule forceps, the teeth of which are sharp and bent somewhat backward. The accidents to which this is open are chiefly the dislocation of the lens with prolapse of the vitreous and its consequences. Hard capsules do not yield, so that the whole cataract comes out with the capsule, which as a rule gives excellent results. Professor Fuchs in Vienna is a great advocate of this method.

Another drawback inherent to this method is the necessity of an excision of a piece of iris; otherwise it is too hazardous to manipulate in the narrow pupillary space. I have devised a peculiar capsule forceps (about two years ago), according to the principle of the nautical grapple-hook. When the branches of the forceps are opened their claws are directed obliquely towards the capsule, and when the forceps closes it grasps the central part of the iris and removes it, when it is withdrawn. I have not used this forceps so much as I might have. The reason was that the tearing of this piece of capsule may dislocate the lens, and leads to prolapse of vitreous when the lens is expelled. Apart from that it produces not a permanent clear way for the passage of the rays of light, as the posterior capsule will opacify, too, by wrinkling and dotting, so that patients who had very good sight in the first three to six months notice, without pain or discomfort, a gradual deterioration of sight, which, however, can be permanently corrected by a second dissection.

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EDITORIAL NOTICE.

The August and September numbers of this Journal have been unavoidably delayed on account of the printers' strike.

## ON PINGUECULA AND PTERYGIUM.\*

BY ADOLF ALT, M.D.

WHEN in 1875 or 1876 Professor Horner of Zürich announced it as his opinion that the little innocent looking tumor known by the incorrect name of pinguecula, was the origin of the very much more important form of tumor, known as pterygium, this idea was looked upon as wholly visionary and even ridiculous.

Arlt's views concerning the formation of a pterygium were in those days the governing ones.

It so happened that in 1876 I had the good fortune to obtain an eye with pterygium, and Goldzieher had the same good fortune a year or two later. Our examinations led to very similar results and seemed to prove that, as a rule, the formation of pterygium took place in accordance with Arlt's ideas. As you know, he assumed a peripheral corneal ulcer which was covered by an inflamed fold of neighboring conjunctiva. An agglutination of the two tissues was followed by a dragging or growing inward of the conjunctival tissue into the cornea, as the ulcer progressed toward the center of the latter membrane. In my specimens Bowman's layer was detached at the periphery and folded on itself, hook shape, as if the conjunctiva, growing into the cornea beneath it, had dragged its periphery along with it. But the most convincing condition was that under the conjunctival tissue a large cavity was found filled with degenerated and degenerating epithelial cells, which appeared to be incarcerated conjunctival epithelium. From these results of my examination I considered Arlt's views proved, in so far that this was at least one way in which a pterygium might originate, and I must still believe this to be true, if only in exceptional cases.

This was, of course, contradictory to Horner's opinion. But in the light of much further experience I can only wonder that in those days not one of the many excellent clinical observers seems to have known of a direct connection between pinguecula and pterygium, and not one, as far as I remember, brought forward any facts in support of Horner's statement.

\*Read at the 10th annual meeting of the American Academy of Ophthalmology and Oto-Laryngology, Buffalo, Sept. 14th to 16th.



The few pingueculæ which I had had occasion to examine histologically before writing my book on the histology and pathology of the eye, were stained in the inferior manner of those days and gave me the impression that a pinguecula consisted of the very much condensed fibrous tissue of the conjunctiva and a hyperplasia of the conjunctival epithelium of such a degree that I could only compare it to an epithelioma. While it is now an established fact that there are such pingueculæ in which the hyperplasia of the epithelium is very pronounced, they seem to be rather exceptional forms.

Both pinguecula and pterygium have since been carefully studied by a number of investigators. Fuchs' work on these subjects is, perhaps, the best known and most generally adopted, although after him Sgrosso, Schulek, Huebner and others have also made careful investigations with results which vary in some points considerably from Fuchs' views.

In speaking of pinguecula, Fuchs states: "The pinguecula consists of a thickening of the conjunctiva due in the main to a *hyaline degeneration* of the connective tissue elements and deposits of free hyaline. The causes producing such a degeneration are the senile alterations of the tissues combined with external noxious influences. The same noxious influences lead in the corneal tissue to a similar hyaline degeneration, as for instance, in arcus senilis (which seems to be wrong), ribbon-shaped keratitis, and yellow spots in old corneal scars. Another important change at the site of a pinguecula consists of an extraordinary increase in number and volume of the *elastic fibres*."

Sgrosso, agreeing in the main with Fuchs, thought that we must distinguish between an episcleral and a conjunctival pinguecula, and he further assumes two subdivisions of the conjunctival form, namely, an epithelial and a connective tissue pinguecula. He seems to have met with an inordinate number of the epithelial variety.

The more recent and important work on pinguecula is that of Huebner. He found as the almost uniform histological characteristics of pinguecula a degeneration of the tissue elements of the conjunctiva in the whole area of the pinguecula. The participation in this degenerative process by the different tissues varied greatly in different specimens.

He found in the main that the tissue of the conjunctiva proper undergoes a hyaline degeneration. This hyaline tissue seems to become compressed and forms under the epithelium a band of varying thickness without nuclei and blood vessels, almost without structure. The tissue beneath this hyaline band consists of innumerable oblique and transverse sections of elastic fibres. He concludes that the elastic fibres which normally occur in the conjunctiva and subconjunctival tissue, become hypertrophied, grow longer and thicker, even ten to twenty times their normal thickness, but he finds no proof of any new formation of elastic tissue. In the hyaline tissue free hyaline is formed in the form of smaller or larger concretions which give the characteristic hyaline stains; in the elastic tissue he finds other droplets and larger concretions which give the characteristic stains of elastine.

Fuchs gave great importance to the hyaline concretions. Huebner cannot agree with him.

The tissue which according to Huebner takes the least part in this process of pinguecula formation is the epithelium, although it is sometimes thicker than normal. Yet, in two cases he found an enormous increase in thickness of the epithelial layers with formation of cell cylinders and buds growing into the depth and accompanied by the well known epithelial pearls, just as we are wont to see it in cases of true epithelioma.

While Huebner thus in a general way agrees with Fuchs, he points out that this author has laid too much stress on the hyaline degeneration of the conjunctival tissue and too little on the degenerative processes in the elastic tissue. It seems as if Fuchs might with propriety say the reverse of Huebner.

As regards a connection between pinguecula and pterygium, Fuchs does not doubt that a pterygium emanates from a pinguecula. Huebner, on the contrary, denies all connection between the two as totally separate processes. In order to explain the manner in which a pinguecula may grow into the cornea and produce a pterygium, Fuchs assumes a "histolytic influence" exerted on the corneal tissue and a peripheral atrophy of the cornea which would produce some form of chemotaxis. He does not accept the opinion of Arlt, and has never seen a corneal ulcer at the head of a pterygium.

Yet he, as well as Sgrosso, speaks of a subepithelial scar formation at the apex of the pterygium, and by it explains the whitish gray line usually seen in that locality.

According to all descriptions, the tissue of the full grown pterygium is that of the conjunctiva pure and simple, and its folds and nooks are covered with conjunctival epithelium. That is, a pterygium in a somewhat advanced stage can histologically hardly be brought into connection with a pinguecula. This is a well known fact, yet, like Fuchs and others, I have clinically seen in quite a number of cases, how a pinguecula would grow nearer and nearer to the corneoscleral margin and finally overstep it and creep on upon the cornea and form a pterygium; and I am also convinced, as we shall see, by histological examination that this is the usual, though, perhaps, not the only manner in which a pterygium is formed. In spite of the great many pingueculæ which we meet with here in America, it is comparatively rare that we have an opportunity of seeing the intermediate stages, since patients pay no attention to a pinguecula and are alarmed at a pterygium only when it has grown so far that it reduces their field of vision, and often not even then.

I have, therefore, when collecting material for my studies, made it a point to get specimens of the intermediate stages, of beginning, not grown, pterygia in order to learn something more about the connection between pinguecula and pterygium. From my examination of this material I have become more convinced than before that a pinguecula is, as a rule, the origin of a pterygium, although I must assume from my own first case of pterygium and from Goldzieher's that once in a while a pterygium may result from a peripheral corneal ulcer in the way Arlt explained it.

As regards pinguecula pure and simple, the results of my more recent examinations agree with those of the previous investigators, but I find that it would be incorrect to claim special prominence for any one of the different degenerative processes described as of more particular importance by several of them. The larger the number of cases examined, the more the apparent differences dwindle out of sight and a general average can be struck.

Thus I found that in most cases of pinguecula the epi-



thelium is of normal thickness or nearly so. In other cases it is in places or *in toto* atrophied. In others, again, there is a decided hyperplasia of the epithelial cover, while some rare cases, as I have stated before, the epithelial hyperplasia is such that it gives the exact picture of an epithelioma, minus an infiltration zone, and can hardly be distinguished from it. In fact, I believe now that a case of epithelioma in a boy, which I published a number of years ago, may have been just such a pinguecula. (See Figs. 1 and 2).

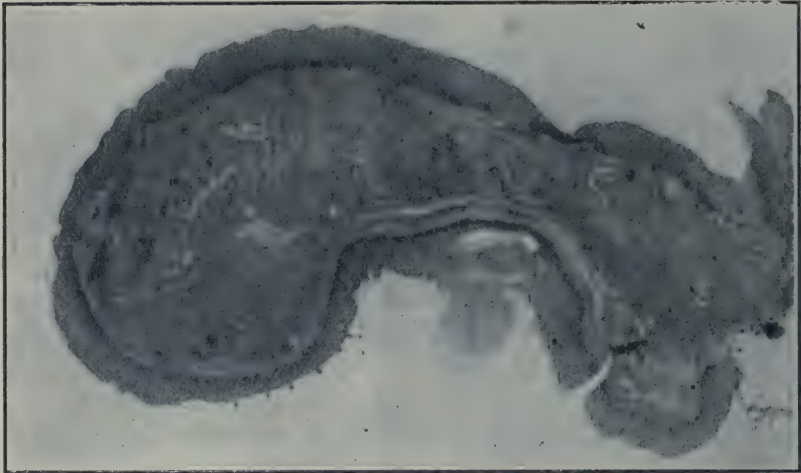


Fig. 1.

Pinguecula showing epithelium of varying thickness; under it is a light, narrow band of hyaline tissue and numerous hyaline concretions. The bulk of the tissue is made up of elastic fibres.

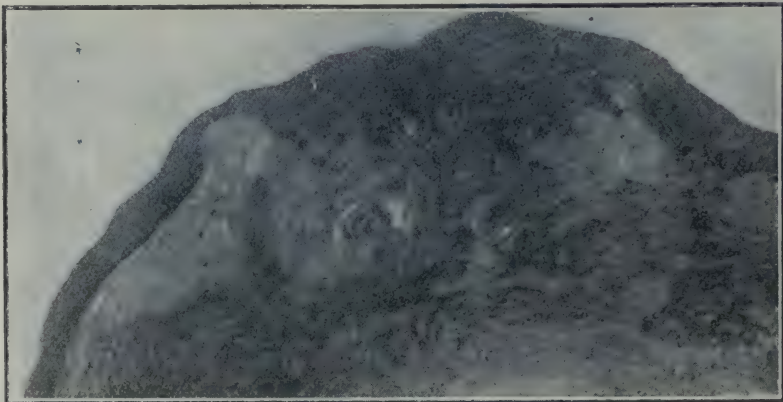


Fig. 2.

Pinguecula with enormous epithelioma-like hyperplasia of epithelium.

Most investigators mention in particular that the conjunctival epithelium in their cases was especially rich in goblet cells. I have not found that this is a very striking feature in my specimens.

The hyaline degeneration of the conjunctival tissue is always present and this band of hyaline tissue appearing in sections at right angles to the surface may be comparatively thin and look very much like Bowman's membrane, or considerably thicker. In most cases its thickness varies in different parts of the same specimen.

In nearly every specimen, smaller and larger concretions of varying shape are found embodied in it or near it, especially on the side toward the cornea. These are deposits of free hyaline and do not differ in appearance and shape from those found in the corneal tissue in old scars. The variety in shape is evidently due to the pressure exerted upon them by the surrounding tissue during their formation.

Underneath this hyaline tissue lies one which with a low power appears granular, almost like detritus. With a high power it is seen to consist of innumerable fibres cut at right angles or obliquely, hence the granular appearance. By means of the proper staining material—I had the best results with Weigert's elastine stain or orceine, but even eosine will do—the fibres can better be recognized and their character as elastic fibres is affirmed. They are much thicker and longer and wavy than the normal elastic fibres. They further undergo a degenerative process which leads to their breaking up and to the formation of similar concretions as those found in the hyaline part. They appear at first in small particles like dust, which gradually coalesce to form the larger conglomerates. I cannot satisfactorily make out whether this mass of tightly compressed and interwoven elastic fibres is solely the result of a hypertrophy of the normally present elastic fibres or whether a new formation of elastic tissue takes place. (See Fig. 3).

Thus far we had to deal with purely degenerative changes in the conjunctiva and subconjunctival tissue. The picture is changed when we come to examine a beginning pterygium. Here I nearly always find that the pinguecula is preceded in its onward march toward the cornea by a dense connective



Fig. 3.

Showing the hypertrophied elastic fibres, and a narrow hyaline band with a great deal of free hyaline beneath the epithelium.

tissue which is rich in cells and which gradually merges into the corneal tissue. At the corneo-scleral juncture the epithelium is usually considerably thickened and instead of the epithelial papillæ normally found dipping into the underlying tissue at this place, I find the epithelial layer thrown outward into a fold in the hollow of which very frequently free hyaline is situated. This gives the impression as if the dense connective tissue during its growth toward the cornea dragged the pinguecula after itself in the same direction. This dense connective tissue takes its origin undoubtedly from the pre-existing conjunctival tissue lying between the pinguecula and the corneo-scleral margin, and seems to me to be the important link between the pinguecula and a pterygium. Evidently the presence of the degenerated tissues of the pinguecula acts like a foreign substance and produces a slow inflammatory reaction in the tissue which severs the pinguecula from the corneal margin. (See Figs. 4, 5 and 6).

A further evidence of an inflammatory process, be it ever so slow, I found underneath the corneal epithelium. Bow-





Fig. 4.

Beginning pterygium. To the left, pinguecula; to the right, the newly formed connective tissue under the folded epithelium.



Fig. 5.

The same as Figure 4, from another case.

man's membrane in the norm begins at the very corneo-scleral juncture. When a pterygium is forming, it begins some distance from this point toward the center of the cornea and always some distance further in, than where the



Fig. 6.

The newly formed tissue under a higher power. Concretions of elastine.

apex of the pterygium lies. That is, its peripheral part has disappeared and is disappearing *pari passu* as the pterygium progresses into the cornea. The cause of this melting away of Bowman's membrane is best seen in early stages of pterygium formation. Here I find numerous leukocytes lying at the site of Bowman's membrane and penetrating into the corneal epithelium. Their action evidently has destroyed it. They are found lying in rows and heaps at the former site of Bowman's membrane and in the basal layer of the epithelium they are seen in the shape of the well known "Entzündungsspiesse" (inflammatory spears). (See Figs. 7 and 8). These leukocytes probably have emigrated from the few small blood vessels which always grow into the corneal tissue in front of the apex of a pterygium.

Thus it seems evident that at the time when a pinguecula gives rise to the formation of a pterygium, there is no peripheral corneal atrophy in the sense of Fuchs' description and no superficial ulcer in the strict sense of Arlt's opinion, but a very similar process with tissue death which goes on in the anterior layers of the corneal parenchyma, in Bowman's



Fig. 7.

Corneal epithelium from beginning pterygium. Leukocytes in basal layer.



Fig. 8.

A similar condition under a higher power from another specimen.

membrane and the basal layer of the corneal epithelium, which might be termed an internal ulcer and which opens the way for the conjunctival tissue to grow in between parenchyma and epithelium.

As the pterygium grows further into the cornea the characteristic features of the pinguecula, as a rule, are gradually lost while the contraction of the newly formed tissue drags the conjunctiva more and more into the cornea. Sometimes, however, the pterygium may have grown for quite a distance into the cornea and still some of the hyper-



trophied elastic tissue may be found near its apex in some of the sections. (See Figs. 9 and 10).



Fig. 9.

Apex of a pterygium with remnants of elastic fibres at the very apex.

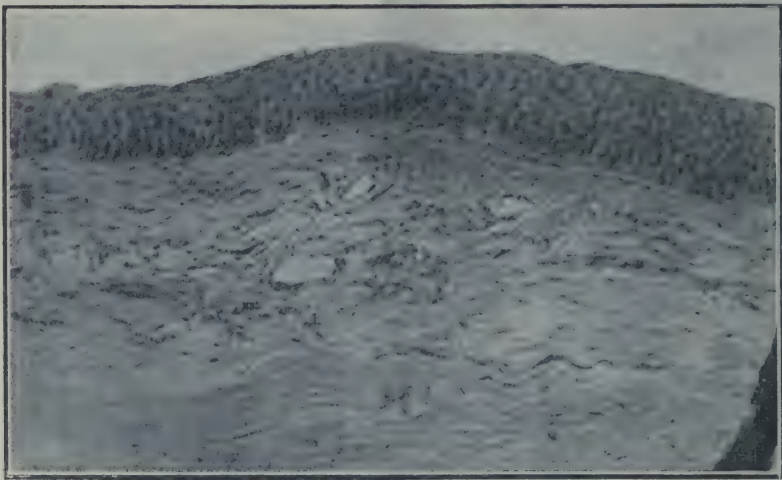


Fig. 10.

Apex of the same under a higher power. The granular tissue is composed of elastic fibres.

I have specimens of another case of beginning pterygium in which the tumor seems to be made up almost solely of elastic fibres. At the corneo-scleral margin where Bowman's membrane should begin in the sections the elastic tissue seems to grow directly into the cornea between epithelium and corneal parenchyma preceded by a few small blood vessels.

I took this eye from the corpse of a negro in the dissecting room and had not seen the man during life, yet the appearance was exactly that of a pterygium internum not far advanced beyond the corneo-scleral margin. (See Figs. 11 and 12)



Fig. 11.

Apex of beginning pterygium consisting chiefly of elastic fibres.



Fig. 12.

The same, further back from the corneoscleral margin.

After all this, it seems to me that the connection between pinguecula and pterygium is no longer as mysterious as it used to be, and we may assume it as certain that in most cases a pinguecula has been the first step to the formation of a pterygium, which does not by any means say that every pinguecula must form a pterygium. Given the necessary conditions, the presence of a pinguecula leads to a slow inflammatory process in the conjunctival tissue which separates it from the corneo-scleral margin, with new formation of tissue. This newly formed tissue, preceded by some small blood vessels, grows into the cornea between epithelium and parenchyma in the place of Bowman's membrane which is destroyed in advance of the oncoming head of the pterygium by an army of leukocytes. The newly formed tissue drags the pinguecula, and the conjunctiva on the other side of it, along in its growth toward the centre of the cornea, and the characteristic tissue of the pinguecula is gradually lost.

The idea that bacteria might figure in the progress of the tumor in the cornea, which I shared at one time with Panas and others, must, I think, be abandoned; at least I have never been able to find any.

Having, perhaps, tired you by this pathological paper, and in order to give you more material for discussion, I just want to add a few words as to the simplest operation for pterygium, the one which I prefer to avulsion, electric cautery destruction, transplantation and all other methods.

Having removed the apex of the pterygium as cleanly as possible from the cornea and excised a rhomboid piece of conjunctiva in the well known old fashion, I make a free cut through the conjunctiva at the limbus upward and downward so as to relax this membrane perfectly. I know that Dr. Savage described these cuts in his operation, but I have made them years before his publication and did not think that I was the only one to whom the value of such relaxing incisions had occurred. After this I cauterize especially the corneal wound vigorously with pure carbolic acid, apply no sutures and close the eye. In several hundred cases of pterygium thus operated upon, I have met with very few relapses.

It seems hardly worth while to say that I much prefer, if



the patient will allow it, to remove a pterygium at its very beginning, or better yet, a pinguecula. The reasons for this are self-evident.

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## MEDICAL SOCIETIES.

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### OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

JOHN TWEEDY, F. R. C. S., President in the Chair.

*July 7th, 1905.*

#### TUBERCLE OF THE IRIS.

This paper, by Mr. M. S. MAYOU, had reference to tuberculosis in general, but more particularly to the case of a boy, aged 3 years, who had tubercular dactylitis previous to the appearance of the tubercular mass in the iris and also at the time this actually appeared. The writer considered that all these cases were secondary to tuberculous trouble elsewhere. In this case the cornea had been invaded, the lens capsule had ruptured spontaneously and several masses of exudation had appeared in the retina. Very considerable centralization in the retina, the iris itself, and at the angle of the anterior chamber, had taken place. Lantern slides were also shown illustrative of the above case.

#### SYMPATHETIC OPHTHALMIA.

Paper by Mr. SIMEON SNELL: This case occurred in a man aged 38, whose left eye had been injured by a sharp piece of metal causing a large wound in the cornea; this wound extended into the ciliary region and resulted in a prolapse of the iris and consequent incarceration of it in the wound. The patient had not been seen until eleven days after the accident, but then the iris had been freed from

the lips of the wound, which rapidly and completely healed. The injury was received on September 8th, 1904, and on October 12th the right—the uninjured eye—was noticed to be red, and five days after there was well-marked iritis, and the case was noted as one of severe sympathetic ophthalmia. A month later the iritis settled down, the iris becoming free; the congestion, redness and pain of the eye began to lessen, and the result after some months was a completely healed eye with vision  $\frac{6}{5}$  and Jg. I, with both the exciting and the sympathizing eye. Since this no further trouble had been complained of. In the discussion which followed Mr. Snell stated that he had not the least doubt but that this was a genuine case of sympathetic ophthalmia, which fortunately had ended much better than most of such cases.

#### SYMPATHETIC OPHTHALMITIS ARISING AFTER ENUCLEATION.

Three cases were recorded by Mr. SNELL in which sympathetic ophthalmitis had come on after excision of the injured eyeball at various times after receipt of the injury; and reference was made to a case reported by himself in the *Ophthalmological Society's Transactions* for 1882, Vol. II, p. 19, in which an eye, injured by a piece of steel which had remained within the globe, was enucleated eight weeks after the accident, and subsequently sympathetic ophthalmitis developed in the remaining eye, 32 days after the enucleation had been performed, and 106 days after the receipt of the injury. In this particular case, eserine had been instilled in the sympathizing eye to allay the irritation, but had apparently acted in a reverse manner, causing a sudden outburst of inflammation in an eye suffering only from subacute sympathetic irritation. In these four cases referred to, one had been a mild attack and had recovered, three had been severe, and two of the eyes had become totally blind.

#### GLIOMA IN MORE THAN ONE MEMBER OF THE SAME FAMILY.

Paper by Mr. SIMEON SNELL: This was the case of a male child, aged  $2\frac{1}{4}$  years, in which glioma was found in each eye. The only other child of these parents was a girl, born in 1897, who was similarly affected with glioma in each eye; in her case death had resulted.

Only some three other observers had placed similar cases

on record, and the writer referred to a paper which he had read before the Society last year (*Ophthalmological Society Transactions*, Vol. XXIV, 1904, p. 230). In this case a child aged 4½ months was found to have glioma in the right eye, which was thereupon removed, and the microscopical examination confirmed the diagnosis. It was then found out that one of the patient's brothers had suffered from glioma of both eyes which—the parents not consenting to an operation—had been perforce allowed to run its course, with the result that each growth fungated into an enormous mass protruding from each orbit, extending down the face and reaching almost to the mouth, so near in fact that the child could only drink out of a cup by throwing its head far back. The child was born on October 5th, 1899, the glioma was first noticed in the right eye a year later, and a few months after this glioma was found in the left eye, still a year later both growths were of such a size as to preclude any operation, and on February 18th, 1903, the child died.

Another case of glioma, first in one eye and then in the other, reported at the same time, had done well since removal of both eyes, the patient being at the present time in good health.

#### MICROPHTHALMOS.

Mr. R. CRUISE: The patient, the subject of this paper, a young woman aged 24 years, had had a swelling in the left orbit from birth, with a small degenerated microphthalmic eye pushed into the upper and outer quadrant of the orbit. During the last two years this swelling had much increased in size with corresponding displacement of the eyeball. Clinically it was difficult to arrive at a differential diagnosis between a cyst in communication with a microphthalmic eye, and meningocele. The swelling, which occupied the greater part of the orbit, was fleshy looking and fluctuating to the touch. Pathologically a free communication was found to exist between the interior of the eyeball and the interior of the cyst in the posterior part of the globe, and the ciliary body being well developed a free passage of fluid secreted by it took place; this accounted for the increase in size of the swelling during the last two years. The cyst contained spaces in which fluid was present, and for the greater part was filled with a mass of rounded cells. Several lantern slides of the sections were shown.—*Ophthalmic Review*.



## SEVENTY-THIRD MEETING OF THE BRITISH MEDICAL ASSOCIATION.

## SECTION OF OPHTHALMOLOGY.

*Held at Leicester, July 24th to 28th.*

The President, Dr. G. A. Berry, opened the proceedings of the Section of Ophthalmology by reviewing the progress in this science during the last few years, and then called upon Dr. A. Bronner (Bradford) for his paper. The latter read the notes of a case of slight myopia in which distressing local and general symptoms were relieved by the use of glasses which were much too strong, and referred to the many cases of wonderful cures reported in the lay press from the use of glasses; many of these cures were undoubtedly due to suggestion only. Mr. E. E. Henderson followed with a paper on the action of eserine and atropine on the pupils and the influence on the filtration of the intraocular fluids. Cats' eyes had usually been used in the investigation, and ether was the anaesthetic employed. He described the apparatus used and the method of experimentation. Mr. N. Bishop Harman gave the results of electric treatment of trachoma at the Middlesex Hospital. He had treated 13 cases, some with X-rays, others with high-frequency current, and others with radium. He explained that in the X-ray cases he used X-rays and nothing else, not the burning rays that are emitted from some tubes. These rays produced no good effect whatever, and after extended trial the old treatment of bluestone, etc., had to be used; 4 of these cases were thus treated; with high-frequency treatment none of the cases showed any improvement. Two cases were then tried with radium, and did no better. Mr. Devereux Marshall gave his experience, and it was entirely unfavorable to the use of both X-rays and radium. Mr. Cril Walker was under the impression that the treatment gave much relief if not cure. Colonel Drake-Brockman thought that nitrate of silver was, years ago, by far the best treatment. Now the other compounds of argyrol and cuprol were as good, and were far less painful. Mr. Harman, in reply, said that no amelioration of the symptoms followed the use of the electrical treatment. He now carefully used silver, copper, and expression. Mr. Bishop Har-

man read a paper on false hay fever. He described the case of a lady who had apparently severe hay fever, and the attack came on each year. He found her astigmatic, and after correction she entirely lost her symptoms. He explained this as being due to an exaggeration in the normal fifth nerve reflex that so frequently started attacks of sneezing. Mr. Devereux Marshall thought that if Mr. Harman's theory were correct it was remarkable that patients should suffer only during the hay season, considering that as much light was present during other months of the year, and also at sea. The president doubted the reflex theory altogether. Mr. Harman thought that after the dark winter the light was felt more than later on, when people were used to it. Professor Hess showed drawings regarding the migration of pigment in cephalopod eyes according to the amount of light allowed to fall upon the eye. Dr. Karl Grossman followed with a lantern demonstration of natural colored photographs of cases of lepra ophthalmica as seen in Iceland, and then read a second paper on congenital absence of the dilatation of the pupil. After the use of atropine nothing but the smallest dilatation of the pupil took place, though there was no synechia. There was nystagmus, and a rudimentary iris in the right eye only. When eserine was used, the pupil became slit-like, and no lens was visible. He also showed a hot-air cautery for the treatment of conical cornea; he had used it in five cases with good result. The application might be repeated several times if necessary. Finally, Dr. Cecil Shaw (Belfast) read notes of a case of amblyopia, apparently toxic; it followed influenza, the patient being a man, aged 20, whose sight was much affected during the attack, and was now slowly improving. Mr. Bishop Harman related a somewhat similar case.

*Thursday, July 27th.*

Work in this section was resumed on Thursday, July 27th, by the introduction of the discussion on intraocular tuberculosis by Mr. W. H. H. Jessop, who first gave a history of the recognition of the disease, and then carefully analyzed twenty cases collected from various sources. In illustration he showed a beautiful series of ophthalmoscopic drawings of a case which he had watched for a considerable time; recovery had so far progressed that the patient's vision had returned

to  $\frac{6}{12}$ . Vitreous opacities, he said, were hardly ever seen with tuberculous lesions of the eye. With gummata there were always dust-like opacities. The question of treatment by tuberculin, as practiced by Von Hippel, was carefully described, and the speaker asked for the experience of others who might have tried it. He expressed the view that the only certain method of diagnosing the disease was by inoculation of material from the affected eye into an animal. Professor Hess said he had used tuberculin in twenty-six cases. As to local reaction, he found it only in two cases, and this was the only way in which they should diagnose with certainty the presence of tubercle in the eye. Mr. Hern (Darlington) said that he thought that tuberculin T.R. was useful for diagnosis, but useless for treatment. Mr. Tatham Thompson mentioned a case in which he had performed excision, and the patient died three weeks later from meningeal tuberculosis. Professor Hess said that he should not fear to excise a tuberculous eye, but he thought it seldom necessary. He was under the impression that it was hardly possible that tubercle could be primary in this situation. Dr. Cecil Shaw described a case in which he had excised an eye for tubercle. Symptoms of meningitis came on, but the patient recovered perfect health subsequently. Mr. J. H. Parsons said that many people considered that tubercle in the eye was often primary. Mr. Beaumont (Bath) related a case. Sir Victor Horsely discussed the question of the differential diagnosis from the appearance of the fundus in tuberculous disease and in gliomatous tumors. He asked the members of the Section if this were possible; if it were, they had advanced considerably in their diagnosis. Mr. Bishop Harman said that in cases of pigmentary choroiditis the vast majority were due to syphilis and not to tubercle. Mr. Jessop replied, and laid stress on the fact that if the sclerotic were affected dissemination was very likely to occur; if the sclerotic were not affected, dissemination was not at all likely. Dr. J. Hern read some observations on the effect of the presence of adenoids in the naso-pharynx in some eye affections. The diseases which usually went with this condition were phlyctenular conjunctivitis, eczematous conjunctivitis, photophobia, and weak ulcers. In all these cases the naso-pharynx should be care-



fully examined. Mr. Benson (Dublin) read a paper on evolution in blepharoplasty, and traced the origin of modern operations from the old scalping procedure which always produced xerophthalmia. He described the most modern operation of transplanting mucous membrane from the lip of the patient, which was equally applicable to the upper and lower lids; this operation has been done hundreds of times at St. Mark's Hospital, Dublin, and the results were excellent. Prof. Hess found that the transplantation of mucous membrane was by far the best operation, and he had done it for years. Dr. Henry agreed that it was a satisfactory method. Mr. Tatham Thompson was not so impressed with its utility. The President asked as to its ultimate results, and Mr. Benson said that it was absolutely permanent; as it was a fortnight after the operation so it remained permanently, but the flap should extend the whole length of the eyelid; partial operations were useless. Dr. Cecil Shaw said that transplanted skin flaps were very satisfactory. Dr. Benson in reply, said that skin was infinitely inferior to mucous membrane, as all skin contained hairs, and the epithelium was quite unfitted to touch the eye; it remained skin forever. The President, Dr. G. A. Berry, gave a description of a new test for visual acuteness which was particularly useful for illiterates and children. Dr. Beaumont thought the test appeared to be most useful.

*Friday, July 28th.*

The discussion on capsular complications after cataract extraction was opened on Friday by Mr. Treacher Collins, who showed photographs of the microscopical appearance of eyes in which the capsule had become entangled in the wound; these showed the very imperfect union which occurred under these circumstances; the capsule acted as a foreign body in the wound. He next discussed the effect of adhesion of the capsule to the wound without its being actually entangled. This did not give rise to delayed union, but its ill effect was due to the drawing forwards of the capsule and iris, and this was likely to cause closure of the angle of the anterior chamber, provided it was sufficiently drawn forwards. As regards the prevention of capsular adhesions and entanglement, he pointed out that, although in the case of a simple extraction

without iridectomy the chances of capsule complication were diminished, yet it could not be altogether prevented, and he showed photographs of adhesion of the anterior hyaloid membrane as well as of capsule which had taken place after simple extraction. As to the relief of tension after capsule complications, most of the operations did but little good. An iridectomy done opposite the coloboma might, if done early enough, be sufficient to open up the angle; and in some cases it was possible to divide the capsule at the place of entanglement with Lang's knives. As regards the prevention of secondary opacities, he advocated the tearing away of the anterior capsule, and gave statistics of his results. The President said that he thought highly of the use of the repositor in every cataract extraction, but if glaucoma came on he always did another iridectomy opposite the original one. Dr. Bronner found that when using capsule forceps, dislocations of the lens and loss of vitreous were more frequent than when the cystotome was used. Mr. Tatham Thompson said that he had never satisfied himself as to the relative merits of capsule forceps and the cystotome. He was much impressed with the benefit of washing out the anterior chamber with M. Keown's apparatus. Mr. Cyril Walker and Dr. Hearn made remarks, and the latter said that he was in the habit of cutting out a circular piece of capsule with the cystotome. Colonel Drake-Brockman said he first of all dilated the pupil fully before the extraction; after the incision he made a triangular opening in the capsule, base up, with a Bowman's needle. He found that he seldom got capsule complication after this. Mr. Parsons spoke on the anatomical aspect, and confirmed the points brought out by Mr. Collins. Dr. Henry thought the reaction was much less when a peripheral opening in the capsule was made than when a large opening was attempted. Mr. Devereux Marshall thought that the posterior capsule had more to do with the development of secondary opacity than the anterior capsule. Mr. Collier Green expressed his views. Mr. Collins, in reply, said he did not think a conjunctival flap made any difference to the entanglement or otherwise of the capsule. He was not in favor of irrigating the anterior chamber, on account of the extra risk of introducing foreign material, such as

epithelium, into the chamber, which he had known to give rise to cysts in the anterior chamber. He did not think that the use of capsule forceps produced excessive reaction, and he was sure he did fewer needlings than when he used the cystotome.—*British Medical Journal*.

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## THE AMERICAN ACADEMY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY.

At the meeting of this Academy held at Buffalo, September 14th to 16th, the following officers were elected for the ensuing year:

President—Dr. Casey A. Wood, Chicago, Ill.

First Vice-President—Dr. J. A. Stuckey, Lexington, Ky.

Second Vice-President—Alvin A. Hubbell, Buffalo, N. Y.

Third Vice-President—Dr. Emile Meyer, New York, N. Y.

Secretary—Dr. George F. Suker, Chicago, Ill.

Treasurer—Dr. Otto J. Stein, Chicago, Ill.

Council—Dr. Casey A. Wood, Dr. W. L. Ballenger, Dr. H. W. Loeb, Dr. Adolf Alt, Dr. John E. Weeks.

The place of meeting is to be determined later.

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## ABSTRACTS FROM MEDICAL LITERATURE.

BY W. A. SHOEMAKER, M. D.

ST. LOUIS, MO.

### OBSTRUCTION IN THE RETINAL ARTERIES.

Allen Greenwood (*Jour. Amer. Med. Asso.*, March 11) says the three most frequent causes of obstructions in the retinal arteries are arterial disease, embolism, and spasm. Thrombosis in a healthy retinal artery is a very rare occurrence, while in the pathological conditions mentioned it is rarely absent. Arterio-sclerosis, occurring as part of a general degeneration of the arteries, is perhaps responsible for more cases of obstruction of the retinal arteries than any other cause, although its importance is not always recognized and the actual condition is frequently overlooked. The ophthalmoscope shows a slight increase in the reflex from the



arteries, with irregularities in their size, and where an artery crosses a vein the latter is often compressed, dilating it at the distal end, and more of the vein is hidden than the apparent width of the artery, showing that the latter has thicker walls than usual. The discs are often slightly congested and a feathery outline is observed, with a feathery exudate beside the arteries. If the central artery in the

#### SLIGHT ERRORS OF REFRACTION AND THEIR INFLUENCE ON THE NERVOUS SYSTEM.

C. E. Prouger (*Lancet*, June 10) emphasizes the fact that slight errors of refraction may exert pronounced influence on the nervous system. He also invariably found errors of refraction in neurasthenic cases, which if not corrected "led to insomnia, extreme depression, great irritability, difficulty of concentration of thought, lack of self confidence, apprehension, weariness, exhaustion, and a general want of stability of the nervous system." Prouger insists that all errors of refraction should be corrected in every case of neurasthenia.

#### THE IMPORTANCE OF TESTING THE OCULAR MUSCLE-BALANCE FOR NEAR AS WELL AS FOR DISTANT VISION.

Samuel Theobald (*Trans. Am. Oph. Soc.* 1904) emphasizes the importance of making a careful test of the muscle balance for near, as well as for distant vision, in all cases of asthenopia, as there often exists a marked difference between the behavior of the muscles in distant and in near vision. When muscle imbalance for near vision exists, glasses adapted for near work, that is to say, lenses, which in addition to correcting the refractive error present, take into account also the muscular fault, should be ordered. Theobald, occasionally, in dealing with the condition of discordance between the far and the near muscle balance, prescribes bifocal lenses, even for young patients. Recently he has observed several cases of hyperphoria, which was present in near vision only, and which proved to be an important factor in the causation of asthenopic symptoms. He has also seen several instances in which there was hyperphoria in one direction in distant vision and in the opposite direction in near vision. These findings indicate the value of making tests of the muscle-balance for near vision.

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## ORIGINAL ARTICLES.

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### THE MAMMALIAN EYE, WITH SPECIAL REFERENCE TO THE FUNDUS APPEARANCES.\*

BY CASEY WOOD, M.D., D.C.L.

CHICAGO.

ALTHOUGH we have had isolated reports of the ophthalmoscopic findings in the eyes of a few domestic animals and of some others easily accessible to man, no comprehensive study of the ocular fundi of the lower animals was made until Geo. Lindsay Johnson, with the assistance of an unusually competent artist (Arthur W. Head), began his investigations over ten years ago. Their first contribution appeared in the *Proceedings of the Zoological Society of London* in January, 1897: "Observations on the Ophthalmoscopic Appearances of the Eyes of the Order Primates," illustrated by four colored plates. In May, 1900, Dr. Johnson communicated to the London Royal Society, "Contributions to the Comparative Anatomy of the Mammalian Eye, Chiefly Based on Ophthalmoscopic Examination." This essay was published in the *Philosophical Transactions*, 194, 1901, pp. 1-82, and reprinted in the form of a descriptive atlas containing about fifty large colored engravings of various animal

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\*Read at the 10th annual meeting of the American Academy of Ophthalmology and Oto-Laryngology, Buffalo, Sept. 14th to 16th, 1905.

fundi from original paintings by Arthur W. Head. This work gave merely the conclusions of the writer, it being his purpose to publish in due time a still larger volume in which the ocular backgrounds of many additional mammals are to be pictured, together with those of representative amphibia and reptiles—the whole to be accompanied by a more complete treatise on the visual apparatus of these zoological subkingdoms.

Shortly after the appearance of Dr. Johnson's larger work I had the pleasure of presenting to the New Orleans meeting of the Ophthalmic Section, in a very incomplete fashion and poorly illustrated with ordinary black and white stereopticon slides, a few of the conclusions reached by the author. I refrained from printing these desultory remarks, partly because of their fragmentary character and partly because I understood that Dr. Johnson was then about to publish his larger atlas in which every zoologist and ophthalmologist might read a full account of this truly marvelous undertaking. Since this volume has, so far, not appeared and as Dr. Johnson's studies have excited comparatively little comment in ophthalmic circles, I again take the liberty, with the permission of the author and the aid of Mr. Head's reproductions in color of his original drawings, to give you some idea of the remarkable work that has been carried on by these two men. Another reason for this demonstration is that the monograph and atlas just referred to is out of print and practically unobtainable.

At the outset let us refresh our memories by looking at the following (Gadow's) classification of the mammals. Observations of the fundus oculi were made by Johnson in 182 species of Mammalia, comprising nine out of eleven Natural Orders, 103 Genera and 47 Families—the Whale and Sirenia being omitted. All the backgrounds were carefully painted, *ad naturam*, by Mr. Head. In these tables, taken from Dr. Johnson's treatise, I have, as far as possible, and for the sake of simplicity, indicated the species by their vulgar instead of their zoological names. In the list you will find italicized the names of those animals whose fundus pictures I hope to show you on the screen.



Natural Orders.	Families.	Genera.	Species and Varieties.
Primates.	Simiæ.	Anthropoidæ.	<i>Man.</i> <i>Chimpanzee.</i> Gorilla. <i>White-Handed Gibbon.</i> Orang.
		Cercopithecidæ.	Pigtailed Macaque. Japanese Ape. Bonnet Monkey. Chacma Baboon. <i>Mandrill.</i> Yellow Baboon. Syke's Monkey. <i>Green Monkey.</i> <i>Black Ape.</i> <i>White Collared Mangabey.</i> <i>Sooty Mangabey.</i> <i>Diana Monkey.</i>
	Lemures.	Hapalidæ.	The Marmosets. Squirrel Monkey.
		Cebidæ.	Red Howler. Lagothrix. Nyctipithecii. <i>Lemurine Douroucoulis.</i> Spider Monkey.
		Chiromyidæ.	Aye-Aye.
	Lemurides.	Lemuridæ.	<i>Crowned Lemur.</i> Brown Macaque. Black and Variegated Lemur.
		Galagoidæ.	<i>Lemur Coquereli.</i> Nycticebus Tardigradus. Loris. Galago garnetti. Maholi. <i>Galago Monterii.</i>
	Chiroptera.		English Bat. Indian Fruit Bat. <i>Australian Fruit Bat.</i>
			<i>Hedgehog.</i> Common Mole.
	Insectivora.		

Natural Orders.	Families.	Genera.	Species and Varieties.
Carnivora.	Pinnipedia.		Sea Lion. British Seal.
	Fissipedia.	Felidae.	Common Cat (many varieties). <i>Serval</i> . Tiger Cat. Siamese Cat. Cheetah. Puma. African Lion. Kaffir Cat. Ocelot.
		Viverridae.	Mongoose. Spotted Ichneumon. Genetta. <i>Levaillant's Cynictis</i> .
		Mustelidae.	<i>Canadian Skunk</i> . European Polecat. Cape Zorilla. Otter. Tayra. Sand Badger. Cape Badger. Pine Marten.
		Hyenidae.	Spotted Hyena. Brown Hyena. <i>Striped Hyena</i> .
		Canidae.	Domestic Dog of many varieties. Indian Wolf. Prairie Wolf. <i>Black-backed Jackal</i> . Common Jackal. Common Fox. Azara's Fox. Fennec Fox. Arctic Fox. Cape Hunting Dog. Australian Dingo.
		Procyonidae.	<i>American Racoon</i> . Bassaricyon. Kinkajou. Ringtailed Coati.
		Ursidae.	Syrian, Brown, Malay and Sloth Bears. <i>Black Bear</i> .

Natural Orders.	Families.	Genera.	Species and Varieties.
Ungulata.	Artiodactyla.	Selenodonta. (Ruminantia).	<i>Indian Ox.</i> Many varieties of the Common Ox, Sheep, Goat and Deer. Reindeer. Gazelle, <i>Bactrian Camel.</i> Llama. Chevrotain.
		Bunodonta.	Wild and Domestic Boar. Hippopotamus.
	Perissodactyla.	Equidae.	Horse (many varieties). <i>Zebra.</i> Wild Ass. <i>American Tapir.</i>
		Tapiridae.	<i>Indian Rhinoceros.</i>
Sirenia.	Proboscidae.	Rhinocerotidae.	<i>Indian Elephant.</i> <i>African Elephant.</i>
		Elephantidae.	<i>Dorsal Hyrax.</i>
	Hyracoidae.		Porpoise.
			Jerboa, Egyptian and Indian.
Rodentia.	Myomorpha.	Dipodidae.	Cape and American Pouched Rat.
		Geomyiidae.	<i>Black Rat.</i> Common Rat (varieties). Mouse (varieties).
	Sciuromorpha	Muridae.	Oak Dormouse. Garden Dormouse.
		Myoxidae.	Common Squirrel (varieties). Marmot. Ground Squirrel. <i>Red and White Flying Squirrel.</i>
		Sciuridae.	Indian Palm Squirrel.
		Pteromyidae.	<i>Canadian Beaver.</i>
		Castoridae.	



Natural Orders.	Families.	Genera.	Species and Varieties.
Edentata.	Hystricomorpha.	Chinchillidae.	Chinchilla. Viscacha.
		Cavidae.	<i>Guinea Pig</i> . Capybara. Spotted Cavy.
		Octodontidae.	Myopotamus Coypa.
		Dasyproctidae.	Golden Agouti. Azara's Agouti.
		Hystriidae.	<i>Brazilian Porcupine</i> . Hairy Porcupine.
	Lagomorpha.	Leporidae.	<i>Common Rabbit</i> (varieties). Hare.
		Dasypodidae.	<i>Hairy Armadillo</i> .
		Myrmecophagidae.	Great Anteater.
		Bradypodidae.	Three-toed Sloth.
		Phascologyidae.	Wombat.
Marsupialia.	Diprotodontia.	Macropodidae.	Tree Kangaroo. Black-faced Kangaroo. Red Kangaroo. Wallaby. <i>Rat Kangaroo</i> .
		Phalangistidae.	Black Phalanger. Squirrel Phalanger. Flying Phalanger.
		Didelphidae.	<i>Virginian Opossum</i> .
		Dasyuridae.	Tasmanian Devil.
		Peramelidae.	Bandicoot. <i>Rabbit-eared Perameles</i> .
	Polyprotodontia.	Echmidae.	Two varieties of <i>Echmida</i> .
Monotremata.			

It may not be out of place here to refer to the methods employed by Johnson and Head in the examination and painting of the fundi of the lower animals. When one knows that this comparatively small section of the work was done on the living eyes of such animals as the lion, tiger, rhinoceros, bear, ourang, camel, tiger cat, zebra, wild ass, kangaroo, polecat, etc., one cannot but admire the bravery, patience and devotion to science for its own sake that have characterized their unique investigations. For example, as I listened to Mr. Head's account of his adventures while examining the ocular fundi of the largest *cobra di capello*, python and crocodile in the London "Zoo," it was borne in upon me that no soldier on the battlefield of science had exposed himself to greater dangers. I would advise those of you who are interested in this particular part of the investigation to read *Pearson's Magazine* for 1903, in which are reported at length some of Mr. Head's experiences while painting these wild animal fundi.

The erect image is the one portrayed in each instance, and the ordinary ophthalmoscope with a kerosene light or a common electric lamp was employed. I had the satisfaction some time ago of sending the investigators an American model of the self-illuminating electric ophthalmoscope, with which, as was self-evident, more effective work can be done in certain cases.

Both eyes were examined, the eyelids being held apart with the fingers or spring specula. In most cases mydriatics — homatropine, scopolamin or cocaine — were employed. General anæsthetics were given at first, but these were found undesirable. Some animals were muzzled or covered with a net, but, as a rule, coaxing, kindness and taming proved more effective. Wherever it was possible, several of the same species were examined so that errors due to diseases or to individual variations might be eliminated. The refraction was determined by skiascopy, and in most cases with and without atropine. The angle of optic divergence was measured by a specially devised goniometer.

Probably the most striking feature of the ocular fundi is the variety and intensity of the coloration. Ophthalmoscopists very justly claim that the background of the human

eye forms a most beautiful colored picture, but it is faded and colorless when compared with that of many an animal lower down in the zoological scale. Indeed, one of my purposes in presenting these pictures to-day, is to introduce a method of reproducing by means of stereopticon slides the brilliant coloring of the animal fundus recently invented by Mr. Head. Recognizing the failure of the ordinary colored slide to accomplish this result, he set to work some time ago to devise a means by which the wonderful coloration of these eyes could be adequately projected upon the screen. The pictures to be shown you to-day are the first slides of this kind that Mr. Head has prepared. I may also say that while the majority of the pictures appear in Johnson's Atlas, quite a few were prepared from drawings that are not reproduced there.

Dr. Johnson has divided the Mammalian fundi, so far as their color is concerned, into three categories: First, the RED TYPE, including every shade of red, brown, chocolate and gray. To this class, for example, Man and all the Primates belong. The YELLOW TYPE includes all shades of yellow and orange. Good examples of this class are found in those animals who have nocturnal habits. The GREEN AND YELLOW-GREEN TYPE comprise, among others, most of the Carnivora and many of the Ruminants. The color of the fundus in many animals is determined or modified by the thickened choroidal, or at least subretinal, layers known as the *tapetum lucidum*, *cellulosum* (in the Carnivora) or *fibrosum* (Ungulata). As is well known, in the nocturnal carnivora it glows and reflects a yellow-green light from its highly pigmented surface.

As will be noticed, many of the normal conditions observed in some of the lower animals resemble those one finds in man as pathological states, as congenital defects or as evolutionary remains. It will be sufficient now to mention the *membrana nictitans*, the retractor muscle of the globe, opaque nerve fibres, white or gray optic nerve-heads, pectinal remains, persistent hyaloid artery, optic coloboma, *retinitis pigmentosa* and visible choroidal vessels.

REFRACTION. The *wild* Mammals are simply hypermetropic; when domesticated for a number of generations they



generally become myopic and astigmatic. Fresh water amphibious Mammals have enormously developed ciliary muscles that enable them to compensate for loss of the refractive power of the cornea when the eye is submerged. The Common Seal and the Sea Lion both have a myopic refraction of 4 D. in the vertical meridian and 13 D. in the horizontal meridian. Their pupils are capable of contraction to a narrow vertical slit, so that they obtain fairly good vision both in air and water. Matthiesen, who examined a number of Whales common to the Arctic coast of Norway, found their eyes astigmatic four or five diopters.

The appearances of the fundus oculi have a decided bearing on *classification*, as will be readily seen even in this imperfect demonstration of Johnson's work. Although, as he points out, a sound classification cannot and ought not to be based upon the peculiarities of a single organ, yet the fundus appearances are so definite and so constant in all the wild species that these can be readily grouped into genera, families and natural orders according to their ophthalmoscopic pictures, a fact that must surely appeal to every zoologist. As it happens, these fundus pictures correspond very closely to the generally received classification, although there are a few disagreements, one or two of which I hope to indicate.

Although Man and the other Simiae alone possess a distinct and well defined *fovea centralis* or macular region, many other animals, the Ruminants and Carnivora for example, have a *sensitive visual area*, devoid of blood vessels, that probably acts as an extensive, although not particularly specialized macula. On the other hand, there is nothing about the background of many animals to indicate that one locality of the retina is more sensitive to light and form than any other.

*The divergence of the optic axes.* Johnson measured this by a special goniometer in many instances. The diagram shows that it is only the Simiae—in other words man and the true monkeys—that possess the power of convergence, and that only they have parallel vision when the eyes are in a state of rest. Parallel vision is associated, as will soon be noticed in the pictures I am about to show you, with a circular disc, well defined retinal vessels and, above all, with a well defined macula. I daresay the association might

be carried further by including binocular vision and extensive crossing of the optic fibres at a well developed chiasma.

#### MAN.

*Primates, Simiae, Anthropoidae, Man.* The first variety of this species is represented in our pictures by the left fundus of a Nubian, aged 17. You will, I think, recognize a striking resemblance between it and that of the anthropoid apes. The background is chocolate colored and the retinal reflexes are very marked, extending over the whole macular region. Translucent nerve fibres can be traced much beyond the papilla. The macula is well defined and surrounded by a brilliant reflex-ring. The choroidal vessels, in contrast to those of the average European eye, are quite invisible.

In striking contrast with this picture is the fundus of a human *albino*, well known to all of you. I call especial attention to the differences in these fundi because each detail has its analogue in the lower animal backgrounds I am about to show you. As in fair-haired Europeans, the general color of the fundus is a light orange red; there is a complete absence of the peculiar glistening sheen observed in the neighborhood of the vessels and macula of the negro, and no traces of opaque nerve fibres can be discovered. The choroidal vessels are readily seen through the imperfectly pigmented background; in some albinos they are visible near the macula.

#### ANTHROPOID APES.

*Chimpanzee (Troglodes niger).* The resemblance between the ocular fundus of this animal and that of the African youth just exhibited is very striking. Except that the differences between the veins and arteries are less marked and that their branches are straighter in the anthropoid ape, they are practically the same picture.

*White-handed Gibbon (Hylobates albimanus).* Here the nerve fibre layer and reflexes are prominent, the macular area is small, while, most noticeable of all, well marked choroidal vessels radiate from the disc to the periphery of the background.

With the exception of the color of the fundus, the ophthalmoscopic characters of man are common to all the higher monkeys.



DOG-FACED BABOONS.

*Primates, Simiae, Cercopithecidae.* The Dog-faced Baboons have a fundus more or less patterned after the Gibbon. The *Mandrill* (*Cynocephalus mormon*), however, exhibits the choroidal vessels more marked than in the Baboon. This ugly looking monkey possesses a power of sustained convergence equal to any of the man-like apes.

This picture does not appear in Johnson's Atlas, but is reproduced from an original drawing by Head, not yet published.

A common example of the medium sized Simian is that active and quarrelsome animal, the *Green Monkey* (*Ceropithecus callitrichus*). Its fundus resembles that of the *Mandrill*, but it has one peculiarity—a macular region twice the diameter of any other Old World monkey.

This painting does not appear in Johnson's Atlas.

Two *Mangabeys*, those lively, good natured and rather common monkeys, often encountered as pets, are represented in this demonstration, neither of the paintings being reproduced in Johnson's Atlas. The *White-collared Mangabey* (*Cerocebus collaris*) has a fundus like that of the *White-handed Gibbon*, except that the macular region is a dark brown spot with a well marked foveal reflex in the smaller monkey.

The *Sooty Mangabey* (*Cerocebus fuliginosus*) exhibits the same peculiarity, a better defined macula surrounded by a complete ring. The choroidal vessels are somewhat plainer than in the majority of the smaller monkeys.

The fundus of the *Black Ape* (*Cynopithecus niger*), an African monkey belonging to the same genus as the *Mangabey*, exhibits a well marked macular ring, probably due to the dark color of the animal itself. The background is gray and the vessel-reflexes show very plainly. His convergence power is excellent.

This is also an unpublished original painting by Head.

The *Diana Monkey* (*Cercopithecus diana*) is a handsome and easily tamed animal, often kept as a pet. Owing to his dark fur and the amount of pigment in his body he has, like the *Black Ape*, a dark gray fundus and obscure choroidal vessels. Otherwise his fundus resembles that of the other



medium sized monkeys.

This picture does not appear in the Johnson Atlas.

*Primates, Simiæ, Cebidæ, Lemurine Douroucolî* (*Nyctipithecus lemurinus*). The fundus of this South American monkey shows a macula well defined, but the macular ring has disappeared. To a considerable extent it resembles the true Lemurs, although its eyes show certain peculiarities. The whole background is covered with dots and resembles the lower lemurs closely, except that the disc is pink, like that of man and the higher apes, and there is a well defined macula. The choroidal vessels are well shown, but not so well as in the White-handed Gibbon.

All the Simiæ invariably have circular pupils that dilate to mydriates and contract to miotics; in that respect Man differs only in degree from the other Simians. They are also the only Mammals that have parallel visual axes and possess the power of convergence, the necessary accompaniment of a macula. It must be remembered that most monkeys are able to converge for a short period only. Johnson notices a peculiar fact, that while the refraction of the higher monkeys, like savage Man, is hyperopia without much astigmatism, the Mandrills and Drills are all myopic from 3 to 6 D. As in Man, the *membrana nictitans* is rudimentary. Man alone sheds tears; the lachrymal puncta and canaliculi are rudimentary in all other Simiæ, although the caruncle is present.

#### THE LEMURS OR HALF-MONKEYS.

*Primates, Lemures, Lemuridæ, Crowned Lemur* (*Lemur coronatus*). Here is a well marked fundus. As in all animals below the true monkeys (*Simiæ*), there is in this background no macula. The disc is chalk colored, as if the animal were the subject of a white optic atrophy. The vessels, however, are well shown and their absence in a particular area probably indicates the location of the sensitive macula.

*Primates, Lemures, Galagoidæ, Lemur coquereli*. Although all the classifications include this animal and the next one whose fundus I shall show you, among the true Lemurs it is evident that ophthalmoscopically there is little in common between them and the Lemuridæ. Indeed it is more than likely that these Galagoidæ are not Lemures at all, but are more closely allied to the night-prowling carnivora,

whose fundi, as we shall see, they closely resemble. As early as 1897 Lindsay Johnson drew the attention of zoologists to this fact in a paper before the London Zoological Society. He said: "When we come to the Lemures we do not find a single animal which possesses even a trace of a macula, and the discs are all round. Instead of being pink they are quite white and the fundus is of a peculiar brown or grayish brown color stippled at intervals with large dots. In the true Galagos the disc is nearly black; the fundus is a rich golden-yellow with a tinge of green and covered everywhere with minute black or brown stellate spots. The star-shaped dots are peculiar to the Galagos and we find them in all, just as we see a distinct family likeness in the Lemures. Among the latter, however, there is one exception, its fundus being identical with that of the Galagos and yet is known as Coquerel's Lemur. I have examined this animal most carefully and am convinced that it is a Galago and not a Lemur. The difference of its eye is too striking to be overlooked and quite outweighs the other differences of structure and habitat."

Looking once more at the canvas we see at once that the animal possesses a *tapetum lucidum et nigrum*, so well shown in the Felidae, and betraying his nocturnal habits. The fundus looks as if it were made of burnished gold strewn with stars. The disc is dark gray and the periphery is covered with a dense network of pigments.

*Galago Monterii.* It will be seen at once that the description just given of Coquerel's Lemur applies exactly to this fundus picture, and one can readily believe that they both belong the same genus. Johnson remarks that the division between the higher and lower orders of monkeys is chiefly marked by the absence of a macula in the latter. The pupil is no longer circular but oval vertically, while the visual axes are not parallel but slightly divergent and are in- of even momentary convergence. Moreover, the disc capable is no longer pink but is covered more or less with black pigment. The Simiæ alone among Mammals rotate their eyes in fixation; the lower families, instead, move their heads, and only on rare occasions and to a limited extent do they move their eyes for visual purposes.

## THE BATS.

*Chiroptera.* The fundus oculi of the *Australian Fruit Bat* (*Pteropus policephalus*) is like that of all bats. It exhibits a picture entirely unlike any that we have so far seen and certainly indicates a lower position in the animal world than zoologists have generally assigned to its owner. The ordinary bats have such minute eyes and pupils that it is extremely difficult to paint them.

The entire background of the Australian Bat is of a uniform pinkish color, covered uniformly with large, round dots which when seen with the ophthalmoscope might easily be mistaken for pits. The papilla is grayish-white and nearly round. There are no visible vessels except a single, minute capillary in the center of the disc. The picture is certainly that of a primitive type. Johnson says that this bat's large, round pupils act sluggishly to light and mydriatics and that continued exposure to bright light produces blindness.

## INSECT-EATING ANIMALS.

Speaking of the Insectivora in general Lindsay Johnson notes that the background is a uniform light gray, their eyes are equally round and small; the cornea is conical, the lids resemble a buttonhole and are destitute of lashes. The eyeball of the Mole can be projected forward several times its own diameter beyond the orbit and retracted in like manner. This is necessary for vision, as the animal's dense fur entirely covers the eye and it is needful that the eye be pushed forward between the hairs and so make a gap through which he can see.

*Insectivora, Common Hedgehog* (*Erinaceus europaeus*). Here we have a fundus of a somewhat higher type than that seen in the previous animal. The disc is small, pink and circular and exhibits two distinct sets of blood vessels. From the center there radiate to the periphery five vessels of unequal caliber, four of them giving off each a small branch on its way. From the edge of the disc spring a large number of capillaries which are soon lost to view. The veins cannot be distinguished from the arteries and there are no visible choroidal capillaries.



#### THE SEALS.

*Carnivora, Pinnipedia, Common Seal* (*Phoca vitulina*). This fundus, like that of all the *Carnivora*, is brilliantly colored, in this instance bright yellow, sprinkled with green dots. The disc is pale, brownish red and bordered with green. Twelve vessels arise from the papillary border, curl over it and are distributed to the periphery of the field. The veins cannot be distinguished from the arteries. (Fig.1)

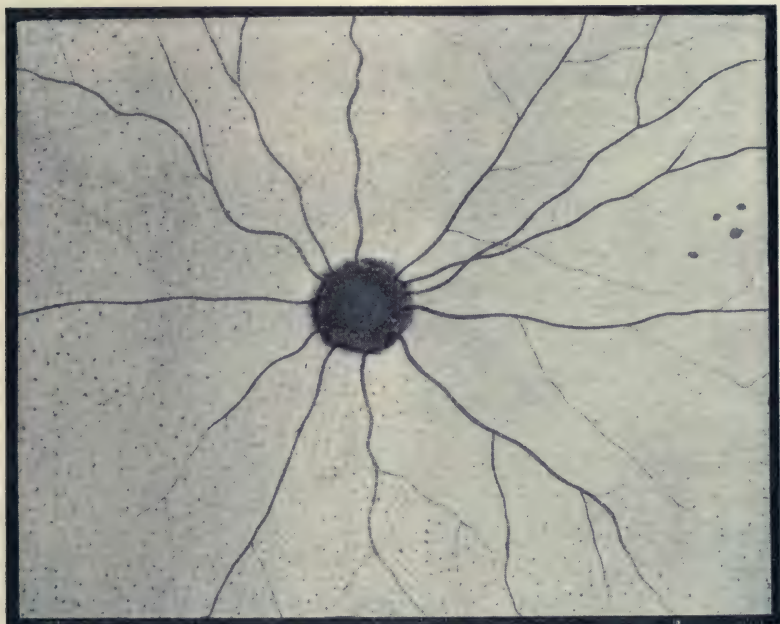


Fig. 1. Fundus of the Common Seal. [Lindsay Johnson Atlas.]

#### BEASTS OF PREY.

*Carnivora, Fissipedia, Felidae.* The *Serval* or *Tiger Cat* (*Felis serval*). This fundus is a good example of that seen in all the cat tribe. Generally there are three distinct, colored zones, the central one occupying about one-third of the whole field. It is light-gold in color, extremely brilliant, and represents the area of best vision. It is also from this portion of the background that the prowling carnivore flashes into the darkness those rays of light that have so long distinguished his yellow-green eyes. This important zone is surrounded by an emerald-green layer of variable

width, while the most peripheral zone is of a dense purple-brown color, probably a part of the ora serrata and insensitive to light. In all the Carnivora the disc is round and cupped, in some instances reminding one of a glaucomatous excavation. The pupils are generally round, although there are many exceptions to this rule. However, the pupils of the cat family are round when fully dilated, contracting to a vertically oval slit or to a straight line in all the small animals, but in the larger animals—the tiger, lion, puma, etc.—they remain round as in man. The Felidae possess no power of convergence and do not move their eyeballs for visual purposes unless trained to do so. It must be remembered, in passing, that domestication and artificial selection *affect the color of the ocular fundus and the refraction of the animal* to a considerable degree. The refraction of domestic animals (cat, dog, horse) is not the same as that of the corresponding wild species—the tendency being always in the direction of myopia and astigmatism. All the Carnivora have a movable membrana nictitans, although few of them move it freely.

*Carnivora, Fissipedia, Viverridae, Levaillant's Cynictis* (*Cynictis penicillata*). The peculiarity of this carnivore—a curious little South African animal something like our Prairie Dog—is that it has no pigmented zones in its fundus, but presents a uniform dark gray or lead color. The vessels that radiate from the disc are readily distinguished as veins and arteries; the papilla is horizontally oval and covered with a network of dark pigment. From it regular, linear, opaque nerve fibres radiate almost to the periphery. Altogether, this animal, as well as his brethren, the Mongoose and Ichneumon, has an ocular background quite unlike the other Fissipedia.

#### THE MARTENS.

*Carnivora, Fissipedia, Mustelidae, Common Skunk* (*Mephitis mephitis*). All the Marten families (*Mustelidae*) have round discs; in some it is cup-shaped and the vessels, as in the Felidae, curl over it. The North American Skunk forms an exception to the usual rule of the Carnivora, in that the disc is white and cupped, with six vessels arising from its margin and opaque nerve fibres radiating from its substance.

The fundus is of a pale, canary-yellow color, changing to a mottled drab near the lower edge of the disc. The *tapetum lucidum* is not as well developed as in the other carnivores. In many respects his animal resembles the rodents; the eyes protrude, there is no membrana nictitans and the refraction is high hyperopia (5 D.).

#### THE HYENAS.

*Carnivora, Fissipedia, Hyenidae.* All the Hyenas resemble the Cats in retinal blood supply and in fundus coloration. There are three zones—the central, golden yellow; the intermediate, green; the peripheral, violet. In the background of the *Striped Hyena* (*Hyena striata*) the disc is brown and not cupped, and the whole field is covered with minute dots, as in the Felidae. The pupil of this species is vertically oval when the animal is at rest, but when disturbed it immediately contracts to a complete circle. This and the further fact of the brilliant central zone in the fundus go along with the nocturnal habits of the animal.

#### THE DOGS.

*Carnivora, Fissipedia, Canidae.* The beautiful fundi of all the Wild Dogs resemble those of the Cats and Hyenas in exhibiting three highly colored zones—an outside one reddish or violet-brown, an intermediate green area and a central zone (*tapetum ludicum*)—characteristic of higher animals—of a bright golden-yellow. The papilla is not excavated and varies in shape and size. The vessel distribution also varies; as a rule both veins and arteries tend upwards before they spread out over the fundus. All the Wolves have round pupils; all the Foxes have oval pupils. From this circumstance alone, Johnson believes that our domestic Dog is derived from the Wolf and Jackal, and not, as some have asserted, from the Foxes. The wild Canidae are hyperopic or emmetropic and free of marked astigmatism, while the domestic Dog often exhibits myopic or compound myopic astigmatism.

In the fundus oculi of the *Common Jackal* (*Canis aureus*) the central *tapetum lucidum* is of a golden color and very large. The intermediate green area is correspondingly small and bordered externally by a narrow violet zone which runs



into the deep purple peripheral zone. The disc is bright pink and lozenge shaped—a form peculiar to the Foxes and Jackals. The central vessels are numerous and stretch well to the periphery.

*Carnivora, Fissipedia, Procyonidae.* The fundus of the *American Racoon* (*Procyon lotor*) has points of resemblance to both the Polecats and Bears. In all three genera we notice the fundus pigment arranged in a crystalline fashion. The pale, golden-yellow zone has a number of rice shaped, yellowish dots scattered over it. The peripheral zone is partly brown in color.

#### THE BEARS.

*Carnivora, Fissipedia, Ursidae.* Nearly all the Bears have round pupils. In the *American Black Bear* (*Ursus americanus*) they are vertically oval; round, when fully dilated. They all have *membranae nictitantes*, which show only when the animal is sleepy. The ocular fundus is about the same in each species and closely resembles that of the Racoon. In our Black Bear the yellow zone is absent, but orange pigment is distributed between it and the peripheral zone. The latter is deep brown, as in the Racoon. The disc is round and cupped; the fundus pigment has a patchy, crystalline appearance, like coarse sugar scattered over the background.

#### HOOFED ANIMALS.

The eyes of the important family of the *Ungulata*, Johnson finds to be divisible, so far as the fundus appearances go, into two great classes. The cloven hoofed (*Artiodactyla*)—ox, sheep, deer, camel, pig, etc.—have numerous large retinal capillaries; while others—horse, rhinoceros, elephant, zebra, etc.—have either very fine papillary vessels or present discs entirely devoid of visible blood supply. The Elephant, Tapir and Rhinoceros have circular pupils; in all the other Ungulates they are horizontally oval. The pupils are insensitive to mydriatics but contract well to light. (Fig. 2).

The irides, as a rule, are composed of two distinct layers, the inner stratum being capable of projection into the pupillary space, in much the same manner as an awning is let down in front of a shop window and for the same purpose.

This *corpus nigrum*, or shield to the sensitive retina from the glare of the sun, is fairly well seen in the domestic Horse and Goat. The best examples occur in the Hyrax, the Camel and the Llama, where it is developed into a special organ, and to it Johnson gives a particular name—*umbraculum*. In the Horse we see it as a simple hypertrophy of the lower pigment layer of the iris. It is somewhat thicker and larger in the Wild Ass, modulated in the Gazelle and Goat, and further elaborated in the Camel and Llama, forming in the

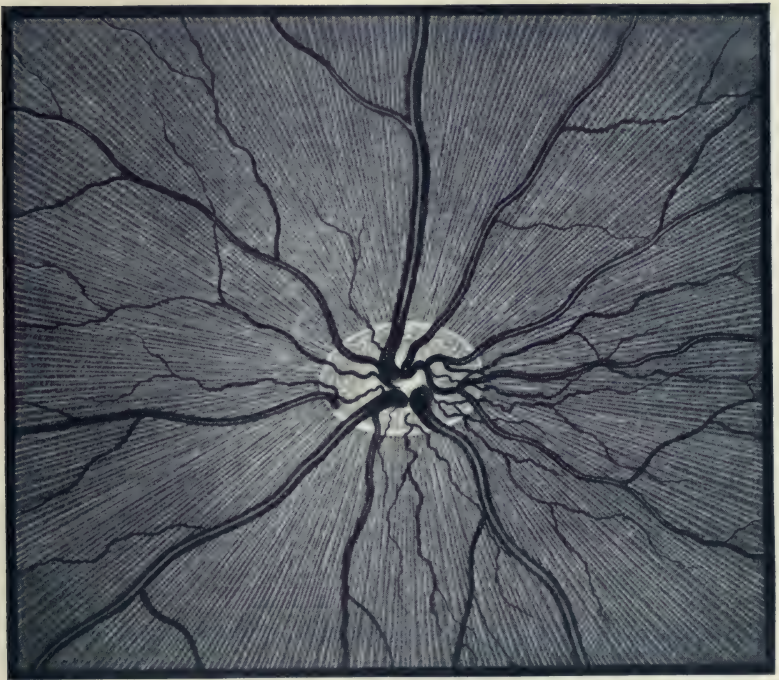


Fig. 2. Fundus of the Wild Boar. [Lindsay Johnson Atlas.]

latter a series of dentate projections that fit into one another when the pupil is fully contracted. In the Cape Hyrax or Klip-dass (an interesting animal that resembles in habits and appearance a Guinea Pig) we have the most highly developed of these appendages. Johnson believes it to be under the control of the will, as its movements are independent of the amount of light.

The refraction of the Ungulata is invariably a compound hypermetropic astigmatism. They have nearly all more or less well developed *tapeta lucida*.



## THE RUMINANTS.

*Ungulata, Artiodactyla, Ruminantia.* The fundus of the *Indian Ox* (*Bos indicus*) is like that of our domestic cow, and indeed resembles those of all the other Ruminants. The disc is horizontally oval and very large, with a central circular depression. The main artery and vein, of large size, spring from the sides of this cup and ascend, giving off, at right angles, branches to the central light colored area. Downwards to the dark peripheral zone run numerous and more tortuous vessels, while the intermediate rose-colored band seems free of vascular supply. Lindsay Johnson believes this middle zone to be the seat of acute vision.

*Bactrian Camel* (*Camelus bactrianus*). This is another remarkable fundus picture, evidently only a variant of the previous one. It is of a uniform chocolate-red (there being no *tapetum lucidum*), the larger part light in color because of the innumerable opaque nerve fibres. The disc is circular, white, and covered with a pigment network. The intertwined artery and vein ascend from the optic papilla, giving off both horizontal and oblique branches.

*Ungulata, Perissodactyla, Equidae.* The fundus of the Horse, Zebra, Wild Ass, American Tapir, Indian Rhinoceros, African Elephant and Dorsal Hyrax—all belonging to the genus *Perissodactyla*—are devoid of retinal vessels. The eyes of the first three may be described as one—that of the Zebra—so closely related is their whole ocular apparatus. The fundus of the *Zebra* (*Zebra burchelli*) is divided into two zones, a peripheral violet-brown zone, deeply pigmented and a central zone, lying immediately above the disc, stippled with purple-brown, star-shaped spots on a colored ground. In the Horse and Zebra the background is yellow-green; in the Wild Ass it is a mixture of yellow and bluish green. The disc is pink and oval; numerous minute capillaries are seen at the disc edge, but these can be traced for a short distance only. Opaque nerve fibres are also present. As frequently observed, domestication affects the coloration of the background; various horses have varied fundus coloring. All the Equidae have a well developed nictitating membrane which they use freely. The pigmented protrusion at the edge of the iris, or *corpus nigrum*, is more highly developed in the wild than in the tame animal.



*Ungulata, Perissodactyla, Tapiridae.* The *Brazilian Tapir* (*Tapirus americanus*) being a night animal, has a bright, golden-yellow fundus which is stippled with orange dots. The peripheral zone is orange-red. There are only a few minute retinal vessels, restricted to the edge of a chalky-white disc.

*Ungulata, Perissodactyla, Rhinocerotidae.* Every Rhinoceros has small, bright, twinkling eyes, the twinkling being due to a rapid, oblique movement of the globe outward and slightly upward, motions performed by the animal every few seconds. In this way the Rhinoceros is enabled to look around without the necessity of turning his massive and unwieldy head. The pupil, 9 mm. in diameter, is surrounded by a dark iris. There is well formed membrana nictitans. The fundus oculi of the *Indian Rhinoceros* (*Rhinoceros unicornus*)—an animal specially protected by dermal armor—is certainly primitive. There is little to be seen except a large, white, round disc in the center of a violet-brown field which is covered with a faint network of pigment.

*Ungulata, Proboscidae, Elephantidae.* The *Elephant*, both Indian and African, has a yellow-ochre fundus with bacillus-like markings which are more prominent in the older animals. The disc is round and grayish-white. A few small capillaries run from the central cup to the margin of the discs. The pupil of the Elephant is circular and he has a well marked membrana nictitans but makes little use of it.

*Ungulata, Hyracoidae.* The most peculiar part of the ocular apparatus of *Hyrax* (*Hyrax dorsalis*) is his well developed *corpus nigrum*. As we already know, it is a highly contractile, awning-like appendage formed by an extension of the upper margin of the iris. Upon exposure of the eyes to bright sunlight it projects downward and forward to the posterior surface of the cornea. The fundus pictures of all the Hyracoidae are almost indetical and somewhat resemble the Elephant. The faintly stippled, reddish-brown background shows a few traces of choroidal vessels. The disc is pinkish and has a few oddly disposed vessels running from its center. Opaque nerve fibres, symmetrically disposed, radiate several diameters from the papillary border.

## THE RODENTS.

The Rodentia have all circular or nearly circular pupils under all conditions of expansion or contraction. The wild animals invariably exhibit hyperopia which tends toward myopia and astigmatism in captivity. Thus domestic Rabbits show all degrees of refraction with astigmatism, while the common wild Hare is markedly hypermetropic. All rodents have the power of retracting the eye into the orbit, the lid closing as the organ is withdrawn into its socket. The nictitating membrane is rudimentary and the cornea is nearly a perfect hemisphere. The crystalline lens in the majority seems to be formed of concentric circles, which make it difficult to examine the fundus details.

*Rodentia, Myomorpha, Muridae.* The fundus of the *Black Rat* (*Mus rattus*) is uniformly gray in color. The *White Rat*, by the way, has the usual bleached background of the albino. No trace of choroidal vessels can be seen. The disc is reduced to a mere point, obscured by the large central vessels, which radiate from the center like the arms of a starfish. Johnson has examined anatomically the optic nerve of these animals and says it is no larger than a cotton thread. Faint opaque nerve fibres are also to be seen in this fundus.

*Rodentia, Sciuromorpha, Sciuridae.* The *Squirrel* has a more varied and more curious ocular fundus than that found in any other genus. This fact inclines Johnson to the belief that in it have been included members that properly belong to other zoological households. The *Common Squirrel* (*Sciurus vulgaris*) shows a wonderfully large nerve-head for such a small eye. It is much elongated, irregularly bow-shaped and placed well above the axis of vision. The whole area of this papilla measures four times that of the Elephant. The ends are distinctly clubbed. The retinal vessels are large as well as numerous, and spring from the margins of the disc in parallel lines. The disc is whitish and depressed below the fundus so that the vessels curl over its edge. Innumerable minute nerve fibres, arranged like the teeth of a fine comb, run from the disc edge. As Johnson says, the whole arrangement reminds one of a centipede. The fundus coloring is pale pink, the retinal arteries cannot be distinguished from



veins, and towards the periphery the choroidal vessels are visible.

*Rodentia, Sciuromorpha, Castoridae.* The Beavers have an ocular fundus all their own. In the *Canadian Beaver* (*Castor canadensis*) the disc is circular and white, with a deeply pigmented elevation at its center. About this organ (probably a hyaloid remnant which projects several millimetres into the vitreous) a few minute capillaries may be seen. Otherwise there are no visible retinal vessels. The fundus is pale brown and covered with a network of choroidal capillaries. There are no opaque nerve fibres. It may be added that the Chinchilla has an almost identical fundus, except that there is no central projection from the disc.

*Rodentia, Hystricomorpha, Caviidae.* The fundus of the Hystricomorpha—chinchilla, guinea pig, agouti, porcupine, etc.—exhibits no retinal vessels, but generally a number of fine capillaries can be seen on the edge of the disc. In most of these animals a pecten-like protuberance, consisting of pigment cells and blood vessels can be seen extending from the center of the disc into the vitreous. The *Guinea Pig* (*Cavia porcellus*) has a fundus something like that of the Beaver except that there is a well marked “sunburst” of opaque nerve fibres with the papilla for its center. As has been noticed, variations occur—even in this primitive eye—under the influence of domestication.

*Rodentia, Hystricomorpha, Caviidae.* The Porcupines—as in the case of the Rhinoceros, Armadillo and other animals especially protected by nature from external injury—have exceedingly primitive eyes. The *Brazilian Porcupine* (*Sphingurus prehensilis*) has a vermillion fundus with orange streaks, probably corresponding to large, concealed choroidal vessels. No retinal vessels can be seen. There is no distinct peripheral area, while the round disc is bluish-gray and devoid of visible blood supply.

*Rodentia, Logomorpha, Leporidae.* The *Domestic Rabbit* (*Lepus cuniculus*) has a vermillion-red fundus; the wild Hare a lake-colored background; otherwise these remarkable pictures are identical. An ovoid white disc is seen, well above the visual axis, from which retinal vessels branch right and left in a horizontal plane. The area they



occupy is covered by a large dense "brush" of completely opaque nerve fibres, arranged like two white horse-tails, or like two ostrich feathers joined at their quills. As the vessels and opaque fibres are confined to one portion of the fundus, vision is not interfered with except in this locality. (Fig. 3).



Fig. 3. Fundus of the Common Rabbit. [Lindsay Johnson Atlas.]

#### EDENTATA.

The eyes of this family are very sensitive to light, and consequently difficult to examine with the ophthalmoscope. The pupil is very small but dilates easily under atropia. As in the Bears, they possess the power of retracting the globe well within the orbit. The fundus is that of a rudimentary visual organ. The background is slightly stippled but is otherwise of a uniform color.

*Edentata, Dasypodidae.* The *Hairy Armadillo* (*Dasypus villosus*) exhibits a typical edentate fundus. It is of a uniform reddish-brown with a large, round, chalk-white disc showing no trace of blood vessels. The papilla is situated above the visual axis; altogether a primitive eye, such as one would expect to find in an animal depending upon armor, or at least not dependent upon his eyesight for food or protection. He has well formed eyelids and winks every few seconds, the eyeball receding each time, while the lids bend inwards toward the apex of the orbit instead of sliding over the globe as they do in man. There is no *membrana nictitans*.

MARSUPIALIA.

In conclusion, we reach the Marsupials. This family—the “odds and ends” of the Mammals—has almost every one primitive eyes. Many exhibit the pecten, as a reminder of their reptilian (or rather sauropsidian) ancestry, and few of them have retinal vessels. All possess circular pupils and an active membrana nictitans.

*Marsupialia, Diprotodontia, Macropodae.* The *Kangaroo Rat* (*Hypsiprymnus rufescens*) has a brownish fundus, with few retinal vessels, but numerous prominent choroidal vessels. The latter are large and of uniform size.

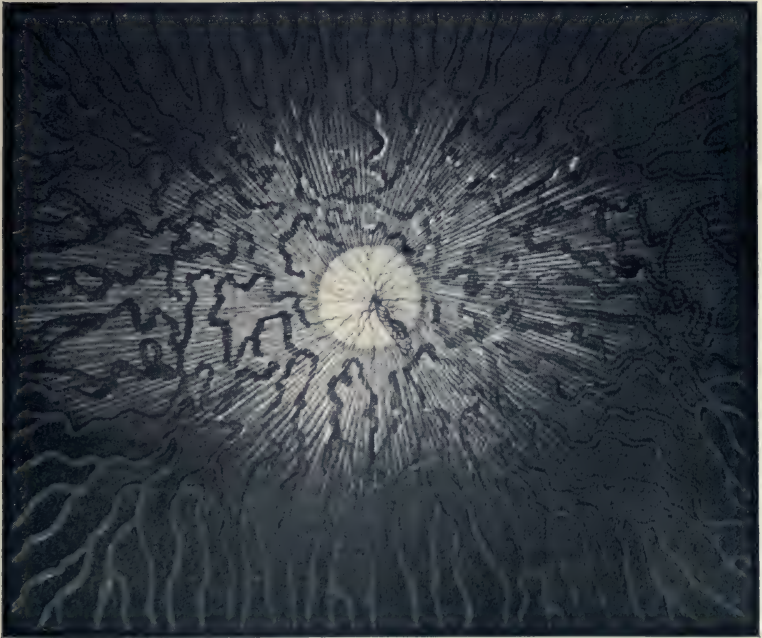


Fig. 4. Fundus of the Rat Kangaroo. [Lindsay Johnson Atlas.]

They ramify throughout the background of the eye and anastomose around the papilla. The disc is yellow white, covered with minute capillaries and presents a sausage-like projection from its center into the vitreous. The latter formation is mostly made up of festoons of vessels derived from the central artery of the retina. (Fig. 4).



*Marsupialia, Polyprotodontia, Didelphidae.* Our own particular Marsupial, the *Virginia Opossum* (*Didelphys virginiana*), differs ophthalmoscopically from other members of his family. The Tasmanian Devil and he are the only members of it with retinal vessels. As he is a nocturnal animal also, he has a well developed tapetum lucidum. The Opossum has another peculiarity: although devoid of a true nictitating membrane, two folds of conjunctival tissue arise from either canthus, meet in the meridian line, cover up the eye entirely in a sort of loose double bag and when function-



Fig. 5. Fundus of the Rabbit-eared Perameles. [Lindsay Johnson Atlas].

ating force the eye back into the orbit. When this organ is in use the animal looks as if he had projecting from his cornea a large edematous tumor. The central zone of the ocular background is of a brilliant golden-yellow, surrounded by a peripheral zone of grayish-black, with interspaces through which the golden-yellow color shines. It has a gray disc, with well developed and equally radiant vessels.



*Marsupialia, Polyprotontia, Peramelidae.* The Bandicoots, have remarkable backgrounds. The *Rabbit-eared Perameles* (*Perameles lagotis*), another curious Marsupial, exhibits a wonderful arrangement of concentric opaque nerve fibres about the disc, extending to the periphery and making a figure like a white China aster. A pectinate remnant covered with minute vessels and fashioned like a miniature wicker basket occupies the center of a gray-white ovoid papilla. Unusually large choroidal vessels ramify throughout the fundus. (Fig. 5).

*Monotremata.* The *Echidna* or *Spiny Ant-eater* (*Tachyglossus aculeatus*) of New South Wales has a circular pupil, no *membrana nictitans*, and a fundus of the most primitive type, all corresponding to his doubtful position in the Mammalian world. Like other Marsupials, he is able to retract his eyeballs. The background is of a lavender color throughout, the papilla being large, chalk-white and vertically oval. Neither retinal nor choroidal vessels are to be seen. Faintly outlined, short-ray, nerve fibres surround the optic disc.

#### CONCLUSIONS.

From a study of the eyes of the Mammals and particularly from the observations made by Lindsay Johnson on the appearances of the ocular fundi, I believe we are justified in drawing the following conclusions:

First—The fundus appearances of the normal Mammalian eye are practically identical in wild individuals of the same species.

Second—Common features in the ophthalmoscopic picture are strikingly apparent in the members of the same genus, and even of the same family.

Third—As a consequence of the foregoing, the importance of using the ophthalmoscope in the classification of animals possessing eyes whose fundi can be seen is of great importance.

Fourth—A complete account of any animal in a systematic treatise on zoology should include, when it is possible, at least a brief description of the ocular fundus. In other words, the practical zoologist should be able to use the ophthalmoscope.

Fifth—Apart from disease, the principal cause of the variations in the color and other details of the fundus oculi of species is domestication.

Sixth—Doubtless the habits and environment of the animal have been the chief factors in determining the coloration and other features of his eyegrounds.

Seventh—Ophthalmoscopic studies of the eyes of the lower animals throw considerable light on the anatomy, physiology and embryology of the human eye.

Eighth—An examination of the eye-interiors of representative species proves that some of the conditions observable in certain animals have their analogues in man as acquired disease, as congenital defects, and as ancestral remains.

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#### JUVENILE GLAUCOMA SIMPLEX ASSOCIATED WITH MYASTHENIA GASTRICA ET INTESTINALIS.

BY JOHN GREEN, JR., M.D.,

ST. LOUIS, MO.

THE train of events leading to the establishment of the glaucomatous state is often difficult to trace. If this statement be true of acute and chronic congestive glaucoma, it is doubly so of glaucoma simplex. Indeed, the problem of the ultimate origin of the latter has seemed to certain acute observers so radically different from the problem of the etiology of acute and chronic congestive glaucoma, that they have not hesitated to remove glaucoma simplex from the category of the glaucomas, preferring to regard it as a progressive optic nerve atrophy with excavation of the nerve head. According to this view the initial process is an optic neuritis which leads to blocking of the lymphatic channels in the nerve sheath; as a consequence, the removal of the products of metabolism is hindered or prevented. "Hence the rise of tension and excavation, i. e., the production of what has been called *posterior glaucoma*." (de Schweinitz).

Assuming that this theory is correct, it becomes of the utmost importance to determine, in every case of glaucoma simplex, whether there may not be present a concomitant constitutional vice which might conceivably have given rise



to optic neuritis. The important rôle of certain general infections (syphilis, rheumatism, influenza, etc.) in the etiology of optic neuritis can no longer be denied, nor can it be asserted that the future will not disclose other constitutional causes at present unsuspected. The majority of such cases do not, of course, eventuate in glaucoma. For such cases as do terminate in the so-called glaucomatous excavation of the nerve head, it seems necessary to assume in addition a special vulnerability of the ocular tissues to the toxic agent.

The subjoined case seems worthy of record, first, because of the rarity of juvenile glaucoma, and second, because it offers some support to the conception of a constitutional origin for the disease.

Miss A. A., aged 30, a tall, spare, sallow woman, came under observation July 7th, 1904. The family ocular history was negative. The personal ocular history was as follows: When fifteen years of age the patient accidentally discovered that she could not tell time on the school room clock with the left eye. The sight grew progressively worse, and six years ago the eye became totally blind. From the age of fifteen to eighteen she attempted to study music, but was compelled to relinquish this pursuit as well as to cease using the eyes for any purpose whatever on account of ocular aching. On two different occasions during the past eight years she has obtained glasses which failed to relieve the symptoms. The eyes have never been inflamed or severely painful.

At present she is entirely unable to use her eyes, the print wavering and blurring almost as soon as she directs the gaze upon the paper. The eyeballs feel tense and ache. There is a sense of pressure in the orbits. Latterly she has had much occipital pain.

Ocular examination: The left eye diverges about  $15^{\circ}$ . The globes are free from congestion, except that the anterior perforating veins in the left eye are somewhat enlarged. The right pupil is 3.5 mm. in diameter, circular and reacts well to light and convergence. Left pupil is slightly larger and fixed. The anterior chambers are of normal depth. Left cornea is anæsthetic. R.E. T+? L.E. T+1. R.E. V.<sup>16</sup>/<sub>19</sub>. L.E. V. faint p.l. Ophthalmometer: R.E. As 1. Mc  $15^{\circ}$ ; L.E. As 3. Mc  $165^{\circ}$ .



Ophthalmoscope: R.E. Media clear; optic disc of a whitish grey and the seat of a steep glaucomatous cup measuring 8 D. The nerve head is surrounded by a well marked scleral ring. Arterial pulsation at the disc can readily be elicited by gentle massage of the globe. L.E. presents quite similar appearances, except that the disc is excavated to a depth of 12 D.

The visual field for white determines a moderate infero-nasal contraction. A diligent search failed to reveal partial scotomata or sector defects within the limits of the field. Color vision normal. No central scotomata either for form or color. Diagnosis: glaucoma simplex, both.

A single small drop of eserine sulphate  $\frac{1}{3}$  of 1 per cent. produced marked but not excessive miosis. The patient was instructed to use a drop of an aqueous solution of pilocarpine muriate  $\frac{1}{2}$  of 1 per cent., three times a day. It was noted that the miosis resulting from each instillation lasted about two and a half hours. The sole effect of this treatment was to lessen the ocular discomfort and partially relieve the occipital pain. There was no effect on the field of vision. Before leaving for home the patient was provided with spectacles for constant wear—R.E. +.75 cyl. ax. 15°; L.E. 0.

One month later the patient returned and stated that she had been practically free from ocular discomfort but was entirely unable to use the eyes on account of the immediate appearance of a blur over the print. R.E. V.<sup>16</sup>/<sub>24</sub>. Alteration in the strength and axis of the cylinder did not improve vision. Visual field unchanged. Pilocarpine solution was supplemented by a  $\frac{1}{5}$  of 1 per cent. solution of the alkaloid of eserine in castor oil, which was used once a day. As the latter drug in this strength produced ocular pain lasting several hours, I substituted a weaker, oily solution— $\frac{1}{10}$  of 1 per cent.—which proved equally effective as a miotic and did not evoke any ocular discomfort.

In October, 1904, it was found that the field on the temporal side had shrunk a little.

In December, 1904, the field was the same as in October, but central V. had gone off to  $\frac{16}{30}$ . On attempting to read a magazine the words "danced and wavered" and the eyes pained.

Up to this point the course of the disease certainly did not augur well for the future. There had been a slow but steady loss of central vision and a gradual drawing in of the temporal field. I suggested to the patient the possible necessity of an iridectomy, explaining the immediate and remote hazards of such a procedure.

With a view of obtaining as much collateral information as possible, inquiry was made into the patient's general medical history. She had never considered herself strong, but had never suffered any prolonged illness. She admitted, however, being habitually constipated, which condition had persisted since early childhood. Numerous drugs had been tried with only temporary relief. The patient was referred to Dr. Jesse Myer, who elicited the following additional points: The father died of stomach trouble, presumably cancer, and the mother of "locked bowels." For the past nine years the patient has had stomach trouble characterized by pain in the epigastrium and belching. She has never vomited or passed blood.

The chief complaint is of constipation. Appetite is good and there has been no loss of weight. The patient can eat practically everything she cares to without suffering distress. The physical examination determined a floating tenth rib, intermittent and weak heart sounds—dropping every sixth beat. There was pain on pressure in the left hypochondrium and posteriorly over the eleventh dorsal vertebra. Stomach displaced downward. Urine showed a trace of albumin (no casts). Diagnosis: *myasthenia gastrica et intestinalis*, probably congenital.

The patient underwent a course of dietary and electrical treatment with abdominal massage for two weeks early in January. Improvement in the abdominal symptoms was immediate. On January 17th the patient volunteered the statement that "the treatment for the constipation had helped the eyes a great deal." It appeared that she was whiling away the tedious hours at the hotel by reading novels, and was gratified to find that each successive day gave her additional ability to use the eyes. She was now able to read continuously for ninety minutes without any sense of strain or blurring of the letters. This statement was confirmed by a reading test in my office extending over a period of two



hours. R.E. V. had risen to  $^{16}/_{19}$ , the recognition of the letters being quick and unhesitating. No enlargement of the field. She was permitted to return to her home with instructions as to the continuance of the constitutional treatment. The pilocarpine and eserine drops were continued.

June 6th, 1905, the improvement in the general condition has been maintained, the patient having a daily movement from the bowels. R.E. V.  $^{16}/_{15}$ . The field has again widened on the temporal side. Treatment continued.

August 16th, 1905, still able to use the eyes freely. R.E. V.  $^{16}/_{12}$ , quick recognition. Field as on June 6th. Patient was cautioned against excessive use of the eyes.

To summarise: A young woman free from hereditary ocular taint and afflicted with a chronic constipation beginning in earliest childhood, is attacked with glaucoma simplex shortly after puberty. In one eye the failure of vision is progressive and results in blindness. Near work is found to be out of the question on account of ocular pain and blurring. Finally, the vision of the fellow eye beginning to fail, she seeks relief.

Treatment with miotics over a period of several months fails to check the progress of the disease. General treatment directed against the constipation is instituted. Improvement in the general condition is accompanied by a like amelioration in the vision, in the ability to use the eyes, and later by a widening of the visual field.

Although inferences drawn from the study of a single case are generally of little value, the sequence of pathologic events in this patient seems to justify the tentative assumption that the gastric and intestinal myasthenia really constituted the *fons et origo mali*. It is well known that in cases of chronic constipation resorption of noxious material from the intestine—copraemia—takes place to a limited extent. It seems perfectly reasonable to assume that such a toxic agent might have given rise to an optic neuritis. If, then, we suppose an inherent weakness in the lamina cribrosa, the chain of events leading to the excavation of the nerve head is complete. Confirmatory evidence is furnished by the notable improvement in the ocular condition immediately following the re-establishment of normal intestinal function.



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## ORIGINAL ARTICLES.

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### THE CILIARY PROCESSES IN ACCOMMODATION.\*

By F. PARK LEWIS, M.D.

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THE object of this paper is three fold:

1st—To urge the importance of the ciliary region as the physiologic center of the eye.

2nd—To point out that the most commonly accepted theory of accommodation lacks one essential element to make it operative.

3rd—To show that the acceptance of this view makes the ciliary region the pathologic center also.

In practically every case that comes under the observation of the ophthalmologist except such as are obviously traumatic or due to some constitutional lesion, and even occasionally in these, that part of the eye of primary importance in its bearing on the conditions present is the mechanism upon which accommodation depends.

Being the intermediary apparatus between the cornea and the retina and having attachments to the choroid, there is actually no intra-ocular disease which may not be modified by the condition of this pivotal structure on which the act of vision turns. It is possible that a better understanding of

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\*Read at the 10th annual meeting of the American Academy of Ophthalmology and Oto-Laryngology, Buffalo, Sept. 14th to 16th, 1905.

the relationships of the tissues entering into the mechanism of accommodation in the human eye, may throw the needed light on the causes of the obstruction of the filtration angle in that obscure problem chronic glaucoma, notwithstanding the experiments of Hess and Heine tending to show that accommodation does not increase the intra-ocular pressure. A fuller knowledge as to the properties and functions of the congeries of bloodvessels constituting the ciliary processes will make clearer the nature of the retrogressive nutritive changes which result, often prematurely, in cataract. The irritation produced by strained focal efforts is often the dominant cause of retrogressive corneal changes, and the relief which follows the use of atropine is due to the quieted ciliary body rather than to any effect of the drug on the cornea itself. It follows, therefore, that as almost all abnormal eye conditions are attached to, if not contingent upon refractive aberrations, it is of first importance that the anatomic and physiologic relations of this region should be clearly understood. It seems curious that with all the careful studies that have been carried on during recent years concerning the finer workings of human structures, one function that as yet has, at least measurably, eluded us, is performed in perfectly plain view, and is under our combined critical observation thousands of times every day. Whenever we look into the human eye accommodative changes are taking place, but so quickly and smoothly do the movements occur that they are absolutely invisible to us. It is only when they are interrupted—when some obstruction gets into the evenly working cogs and the natural processes are retarded—that we can in some measure see what had been taking place. It is, to change the figure, as though a stream were flowing so swiftly as to appear to stand absolutely still and it is not until the flow is impeded that we are able to realize the nature of the current and the rapidity and direction of its motion. Hence it is that, important as are the studies of the physicist and physiologist concerning this function of the human eye, it is to the clinician and the pathologist that we must come for the final word on the subject.

The test of a theory is that it perfectly explains the action of the organ to which it applies; and it must fall in line with

each clinical condition as it arises. None of the theories which have so far been formulated in regard to accommodation meet those requirements, and I wish to suggest one which seems to do so.

Briefly, there are three possible methods by which accommodation could be effected, excluding, as disproven, any alteration in the curvature of the cornea, or of the fundus, or any backward and forward movement of the entire lens. These are: First, the method of Helmholtz based upon an inherent elasticity within the lens capsule with a relaxed zonule and requiring for a shortened focus an increase in curvature of the entire anterior lenticular surface. Second, the method of Tscherning founded on the assumption of the formation of a lenticonus in accommodation, with a tense zonule; and, Third, the method of Dudgeon which seems to have been overlooked by most observers, as I can find no reference to it, and which assumes an inelastic lens and requires as an explanation of its focal adjustment an axial rotation which as the lens is paraboloid in form and not biconvex, would give in effect precisely the lenticonus that Tscherning thinks that he has demonstrated.

Assuming then that Tscherning's observations which have been so carefully made and so accurately described are correct, and omitting any discussion at this time as to the possibility of an axial rotation as suggested by Dudgeon, the inquiry naturally arises whether the mechanical changes which occur in accommodation are inadequately explained by the employment of the ciliary muscle alone. It does not seem to me that they are. It would be impossible with a relaxed zonule, such as Helmholtz thought obtained in accommodation, to have the lenticonus as a result which Tscherning has practically demonstrated. Tscherning's theory on the other hand does not seem adequate to explain the phenomena which undoubtedly occur. Long before Bowman's discovery of the long fibres of the ciliary muscle, or of Müller's of the circular ones, it was believed that the large vascular plexuses constituting the ciliary processes and which from their very bulk occupied so much of the limited space in this region exercised an influence on accommodation. But when the microscope showed the true structure of the ciliary muscle,



the assumption quickly followed that it was to its action alone that all focal changes should be ascribed and that the ciliary vessels had purely secretory and nutritive functions. When, however, we note the size of these vascular masses, especially large in some of the lower animals, and consider how their bulk would be increased when engorged with blood, it can scarcely be doubted that the resultant pressure would affect the delicate adjustment upon which they actually lie.

The long fibres of the ciliary muscle are attached anteriorly in the sclero-corneal tissue constituting the boundary wall of Schlemm's canal. They are attached posteriorly to the choroid. The fibres of Müller form the angular ring beneath those of Bowman.

The physiologic action which follows would almost seem obvious. A contraction of the long fibres relaxes the zonule. Coincidentally with this, the circular fibres surrounding the margin of the iris contract, impeding the free venous flow and causing the ciliary processes to become turgid with blood, they in turn pressing, by their bulk, on the anterior part of the suspensory ligament of necessity flatten the edges and protrude the center of the lens in exactly the form that catoptric tests have shown to be present.

Accommodation having been completed, the muscles relax allowing the vessels which had been full, to empty, in all probability in doing so allowing the overflow to pass into Schlemm's canal.

It will be evident from this that as the artery leads by way of a very large capillary into the anastomosing mass of veins that the passage of blood into the capillary processes is practically unimpeded. That an increase in bulk in the ciliary region occurs in accommodation, has been noted by Tscherning who does not ascribe it, however, to the cause which I have given. He says, "There is formed during accommodation at the anterior surface of the iris a circular depression—the peripheral border of which corresponding to the ciliary body rises in a peak while the central border presents a very gentle slope corresponding to the anterior surface of the crystalline lens."

In order to understand the mechanism of binocular vision, it is necessary to predicate not only a cortical macula but for

each terminal retinal element a corresponding neuron in the visual center. We have, then, two overlapping impressions requiring exact adjustment in order that the foci may be clearly defined in every meridian of each area. That this nicety of adjustment may be maintained it is not alone necessary that the angle of fusion, as Nagel calls it, shall be correctly balanced, but that every retinal meridian shall be so focused that, if possible, a visual image free from distortion shall result. With both corneæ nonastigmatic to obtain such a perfect visual impression requires the co-operative efforts of all the extrinsic muscles and both the ciliary bodies. Paralysis of the nerve supplying any one of these muscles will make such a result impossible. Perfect vision, however, as nearly as it can be measured, is also obtained when the corneæ are moderately astigmatic and in occasional instances when marked differences in the radii of the corneal meridians are present. It does not seem possible that this could be produced by rapidly alternating the meridians through which the approximately perfect vision can be obtained, which is the usual explanation of this phenomenon. Moreover, it is a well authenticated fact that the astigmatic angle changes under a cycloplegic.

Tscherning accepts the idea that it is possible by exerting traction on the suspensory ligament on opposite sides through the same meridian to make a lens astigmatic, and quotes in a foot-note in his *Physiologic Optics* the interesting experiment of Stadfeldt upon a lens freshly removed from the human eye. "In consequence of traction" in opposite direction "he always caused astigmatism, the maximum of curvature corresponding to the direction of the traction. On a crystalline lens belonging to a person aged 38 years he thus produced an astigmatism of the anterior surface of 4 diopters. The posterior surface was very slightly influenced. The astigmatism disappeared with the traction."

These facts justify the belief that accommodation is not always produced by the action of the entire ciliary body, but that opposing segments in the same meridian may in whole or in part correct the opposing corneal deformity. The number of ciliary processes is not uniform in all eyes. There are usually about seventy-two, which would divide the

corneal periphery into arcs of five degrees each, as small a division of the circle as is necessary for an astigmatic correction.

In normal accommodation, then, there must be a conjugate action of the part of each ciliary neuron with the corresponding neuron in the fellow eye. In astigmatism nervous energy would be carried to corresponding groups in the two arcs of the same meridian in each eye and in unsymmetric astigmatism to disassociated groups in unsymmetric meridians.

This explanation of the ciliary activities makes it quite possible to understand the development of sympathetic ophthalmia with an absence of infectious germs.\* A traumatism involving a ciliary segment in one eye causes a persistent irritation at the point of injury. Since there is a conjugate action on the part of each process with the corresponding process in the fellow eye, the excess of energy transmitted to the one eye is also sent to the other and the sympathetic irritation becomes an inflammation or a cyclitis. As the nutritive conditions of the lens are dependent upon the smoothness with which the ciliary processes fill and empty themselves, refractive errors, especially when astigmatic, interrupt its normal lymph supply and, if not the direct cause of cataract, are not rarely an important element in its development.

Now, if the idea to which I have given expression be the true one, that the ciliary *processes* constitute true erectile tissue and enter as an essential element into the accommodative act, a series of pathologic events may be explained in logic sequence, for is it not the irritation of muscular effort that would result from any form of eyestrain but a venous stasis involving the veritable physiologic center of the eye.

After years of controversy, Schwalbe's contention that Schlemm's canal is a venous reservoir serving to receive the overflow from the active ciliary processes has now been very generally accepted as practically proven.†

It would follow, then, that any undue or irregular accommodative effort would produce a passive ciliary congestion

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\*Ayres and Alt, American Journal of Ophthalmology, Feb. 1898.

†See "System of Diseases of the Eye," Norris and Oliver, p. 250.



rather than an irritation. This would involve the venæ vorticosæ.

Since convergence and accommodation are coincident they must for their normal accomplishment require a perfect balance of all of the muscles entering into the visual act. Excessive strength either anatomic or dynamic on the part of the externi causes undue effort on the part of the interni with ciliary spasm, which is congestion of the ciliary processes. We will look then in malignant myopia not to the refraction alone but to the muscular imbalance before the progress of the disease shall be halted. As the nutritive channels arise from the same source the same cause might under other conditions in the young, cause like degenerate changes in the anterior part of the eye producing conical cornea and in the adult, glaucoma. It is not the purpose of this paper to discuss these possible resultant changes, but to urge the importance of the vascular element in accommodation and to point out the long and important line of ocular lesions which may find adequate explanation in this theory.

Indeed, accepting the theory of the segmental and conjugate action of the ciliary muscles together with the associated action of the ciliary processes as an essential element in accommodation, we have an intelligent explanation of the causes of inflammatory and degenerative changes within the eye dependent upon astigmatic conditions and muscular imbalances and through the same causes by disassociations of correlated brain centers of irritative, nutritional and psychic disturbances involving other and remote organs.

#### DISCUSSION.

DR. LUCIEN HOWE (Buffalo): It strikes me that our early masters in ophthalmology and students of this subject are after all not so far apart from each other in their conclusions. The evidence tends to show that the contraction of the ciliary muscle is to relax the zonula. In spite of that, however, we must regard the accommodation as essentially an active effort.

Hess says if you take the eye of a child and dissect it out and draw on the ciliary processes, you can get reflections from the anterior and posterior surfaces and notice what

effect traction has on the shape of the lens. The eye of an ox or a hog can be used for that.

Another point in regard to the position of the lens: We usually think of this as being placed exactly perpendicular to the axis of vision; that however is not the case—it is ordinarily tipped temporalward, or also a little forward. If you doubt that, take the ordinary ophthalmometer and remove the prisms, thus converting the instrument into a telescope, and the reflections from the lens show clearly its abnormal position.

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### SOME OF THE ACCIDENTS AND COMPLICATIONS MET WITH IN THE EXTRACTION OF CATARACT.\*

BY D. W. GREENE, M.D.,  
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THE writer has enjoyed unusual opportunities during the past twenty years for observing the process of opacification of the lens in a large number of men past middle life, and also to have made upward of one thousand extractions of the lens in private and in hospital practice and in the "eye wards" of the the hospital at the National Military Home, near his home city, after different methods and under different conditions. This experience has given him the opportunity to judge of the relative merits of the different operations usually employed and to select those best suited to the class of cases he meets with.

The purpose of this paper is to treat of accidents and complications, as he has seen and treated them.

A well conceived and properly executed extraction is probably the acme of surgical skill. No other operation approaches it in definiteness of conception, delicacy of execution, in the nicety with which the different steps are carried out, the object to be attained, and lastly the contentment and joy it has brought to humanity. Other operations relieve suffering, some prolong life, and some correct deformity, but the extraction of the opaque lens does all of these

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\*Read at the 10th annual meeting of the American Academy of Ophthalmology and Oto-Laryngology, Buffalo, Sept. 14th to 16th, 1905.

and more. Unfortunately this ideal is not always realized by operation. Accidents and complications confront us on every side, and sometimes defeat our best endeavors for the restoration of vision.

Going briefly into a historical review of the operation, in 1706, Petit, as I understand it, was the first to extract the lens (not a cataract) for restoration of vision—a dislocated opaque lens, from the anterior chamber, through an incision not definitely located, but probably corneal, made with a large needle for the puncture, and scissors to complete the section. The credit of priority in extracting the lens is usually given to Daviel, in fact a monument stands in a little cemetery about two miles northeast from Geneva, Switzerland, commemorative of this claim. Daviel himself has given the credit of priority to Petit, but there can be no question, I think, that the credit of operating for cataract, by extraction, for restoration of vision, within historic times, belongs to Daviel, 1745. Beer and others followed him and added iridectomy and, best of all, Beer devised the triangular knife which bears his name, and has been the most important factor in the evolution of the flap operation, since it enabled the operator to make the section with one instrument, which had not been possible up to his time. While the operation and the knife are seldom used now, the lessons to be learned from its use and the principles involved in its execution have been of great value. (Waldau's scoop-extraction with small corneal section, in 1860, was another step in the evolution of the operation).

Mooren's flap section and preliminary iridectomy in 1862, and Jacobson's method, followed about the same time.

This brings us down to 1865, a period of 120 years in which all extractions were made after the method of Daviel, with all the accidents and complications inherent in the method, due largely to the great size and peripheral location of the incision and the bruising of the iris in delivering the lens, and a lack of knowledge of aseptic precaution for the prevention of wound infection, and lastly, the local anæsthetic power of cocaine was not known.

Von Graefe's linear extraction with the long, narrow knife which bears his name, came into general use after 1865.



It was soon found desirable, on account of accidents and complications which occurred, to shift the line of the incision from the edge of the sclera forward into the cornea and combine an iridectomy with it, as Desmarres had done since 1856.

This brief review is not intended to go more deeply into the subject than seems necessary to illustrate the title of the paper, and show that many of the accidents and many of the complications were inherent in the methods themselves and in the want of knowledge of pathological processes as illustrated in wound infection—the *bête noir* of all operations. It could easily be shown that accidents are not so common and complications not so serious as in former times, but these facts are self-evident and need not be repeated here. The simple operation as made to-day is essentially that of Daviel, except that the incision is made upward and with one knife. The combined operation is made in all respects just as it came from the hand of Von Graefe, with the single exception that the incision is shifted and is now made within the cornea. Truly there is little that is new in cataract extraction. The eye is a small organ, and, it would seem, has been exploited surgically to about the limit, that is to say the number and kind of operations it will admit of has been about reached; henceforth it would seem that the application of the principles that underlie these operations and their adaptation to different conditions, attention to the preparation of the patient, attention to the carrying out of details, and the care of accidents and complications as they arise, will be the portion of future operators.

No arbitrary definition of accidents and complications can be given, nor a rigid distinction made between them, but for our purpose it will be sufficient to regard accidents as preventable happenings. In other words, they are some departures from the usual steps of an operation which should not have occurred, for which the operator, as a rule, is responsible. Accidents are operative, and occur during the different steps of the operation. Introducing the knife upside down, while not an accident of frequent occurrence, happens to all men who do much operating. It is inexcusable and ought never to occur, to an operator of good vision,

and need not if we would be careful to look for the name of the maker which is usually stamped on the back of the knife handle, and is a good guide to the location of the cutting edge. Fortunately it is not a serious accident. By withdrawing the knife and waiting for fifteen to twenty minutes, the chamber will have filled again and we can proceed as if nothing had happened. Turning the knife without withdrawing has been tried, but the aqueous escapes, the chamber is abolished, the iris falls over the blade of the knife, and a counter-puncture cannot be made without doing damage to the iris; therefore this plan has been partially abandoned. The aqueous is allowed to collect and then proceed as if nothing had happened out of the ordinary.\* Failure to enter the anterior chamber with the point of the knife and pushing it through the lamellæ of the cornea can easily happen to the inexperienced operator, and a section made too angling through the cornea, will leave a broad linear opacity.

Probably the most frequent accident met with is that of making the section too small for easy and gentle delivery of the lens. In the writer's experience, it has happened from one of three causes: first, failure to appreciate the relative size of the lens to the diameter of the cornea; second, from rotation of the globe on its axis, from pressure in making the puncture and passing the knife through the anterior chamber for the counter-puncture. (If the knife is sharp this is not likely to occur). Third, from making the section so slowly that the aqueous escapes, the iris falls over the blade of the knife and the position of the point when counter-puncture is made cannot be seen. If the section proves too small it should be enlarged with scissors sufficiently to admit of easy delivery of the lens, for it is far better to have too large an incision than to force the lens through an insufficient opening and bruise the angles of the incision, entangle the iris, and strip off cortical matter. The angles are favorite starting points for infective processes, and cortical debris cannot always be seen until it becomes opaque. It is not

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\*Since this paper was read the writer has had this accident happen to him again. It was remedied by making the counter-puncture quickly, rotating the knife and completing the section quickly. And he has lately seen the same accident happen to Dr. Knapp in New York, who treated it in the same way.



always absorbed, but may become organized and then must be dealt with surgically at a later date. Hæmorrhage into the anterior chamber may come from the incision being too far back in the corneo-scleral junction. It may occur on completion of the section or after the iridectomy has been made. Previous inflammation from any cause, operating to increase congestion in the anterior segment of the globe, predisposes to it. It is seldom serious enough to interfere with the subsequent steps of the operation, and if removed quickly by pressure with spatula before it coagulates, time is given to deliver the lens, the pressure of which usually stops the hæmorrhage. If it still persists, a sterile solution of adrenalin may be injected. The presence of the hæmorrhagic diathesis complicates the situation.

The iris falling over the knife while making section usually occurs from one of two causes, or both operating together. High normal tension, or making the section too slowly. The writer has not had much trouble from this accident since he adopted the plan of turning the blade of the knife forward, when it occurs, at an angle of from 60 to 70 degrees, and pressing backward with the back of the blade while the section is completed in the usual sawing manner. The same manœuvre serves a good purpose in preventing this accident in cases of mature cataract where the process of opacification is just completed and the swelling of the lens obliterates the anterior chamber and it is not desirable to wait for shrinking.

Statistics show that prolapse of iris occurs in from three to ten per cent. of cases among the best operators and with the average class of patients. In our last 100 simple operations, we had this accident occur in ten cases. This is too high a per cent., and we have sought an explanation of it, in the character of the patients we have to deal with. As a rule they are not good subjects for operation. Many are broken in health and feeble in mind from dissipation and other vices.

The danger seems, to a certain extent, inherent in the operation itself, and also to the unknown condition that causes one patient to have higher (normal) tension and greater tendency to prolapse than another, and not to the operator; if it were otherwise, we could name a long list of



experienced men who ought not to meet with these accidents, but they tell us they do meet with them—therefore it seems reasonable to conclude that the cause of their occurrence is fundamental, inherent in the method itself, or rather in the principles that underlie its performance and the causes given above. This view is emphasized by the fact that the accident in the modified form of entanglement is seldom met with after a well executed combined operation when careful attention has been given to details and to the so-called toilet after the operation.

The writer prefers the combined operation for the class of patients on whom most of his operations have been performed, and makes it in the great majority of cases. The objections urged against it that it mutilates the iris and furnishes a focus for infection there, is more than offset in his judgment by the difficulties encountered (in delivering the lens and the accidents entailed) in the simple operation. But he is always ready to make the simple operation when the case seems suitable for it. This point is usually decided by the behavior of the iris, when the section is completed. If it prolapses, it is returned and smoothed out with a spatula; if it is retained, eserine is used and the bandage applied. In two or three hours the eye is again inspected. If the iris is in place the bandage is re-applied. If, however, it is found prolapsed, the speculum is introduced and entrusted to the hands of the assistant who lifts the lids away from the eyeball in the manner detailed elsewhere. If vitreous has been lost or is presenting, the speculum is dispensed with entirely and the assistant holds the lids apart while an iridectomy is made, the bandage is applied again, and the eye is not opened for twenty-four hours. Then if the anterior chamber is established, atropia is used; if the pupil dilates, it is repeated again in twenty-four hours. If it does not dilate, it is not repeated. It can do no further good, and in strong solution (4 per cent.) its action will last for twenty-four hours more, when there is usually no further need. The writer always uses this strength of solution in post-operative cases; by turning the head to one side and making pressure over the canaliculi he has never seen constitutional symptoms more formidable than dryness of the throat.

Loss of vitreous has happened to the writer, unfortunately, eleven times in his last 100 cases, nine times after the combined and twice after the simple operation. In no case was the loss sufficient to put the case in immediate jeopardy, and the lowest vision obtained was one-tenth with correction. In three of the eleven cases the simple operation had been attempted, but because of low tension and difficulty in delivering the lens, iridectomy was made, and delivery in the usual way with vitreous loss after the lens had been delivered.

In three cases loss occurred from straining during the operation. Three more lost vitreous in delivering the lens by hook; and in two more it was lost in delivering the lens in the capsule.

The writer has sought an explanation of the frequent occurrence of prolapse of iris and loss of vitreous, on this hypothesis: that given the type of skull in which the orbital cavities angle so far outward to the plane of the face, the recti muscles, acting within the muscular cone, exert an undue compression or traction on the eyeballs and cause the incision to gap. In such a contingency he believes these accidents very liable to happen. Some such explanation it is generally believed is capable of explaining the spontaneous cure of strabismus, and some such explanation seems necessary to explain the occurrence of prolapse and vitreous loss when no other cause for their occurrence is manifest, after excluding rough handling during the operation and high (normal) tension. In this connection reference is made to patients with very prominent eyeballs and orbital cavities noted above, where the speculum may make undue pressure and cause iris prolapse or vitreous loss, and also to those patients with small, deeply set eyes, with heavy, overhanging brows, where loss of vitreous may occur from the manipulation necessary to deliver the lens, especially if it is fluid, or rather not of normal consistency.

The lens is easily dislocated during the performance of capsulotomy if the cystotome is not sharp and undue pressure is required to open the capsule, or if an attempt is made to extract the anterior leaf. The accident usually happens in hypermature cataract where the capsule is found tough and thickened, from changes which begin after the maturity of the cataract. The causes that operate to produce this con-



dition seems to have a different effect on the zonula. It is found fragile and easily ruptured; in such a condition the lens can be easily extracted in the capsule, and this method of dealing with it is generally followed.

We all meet with difficulties in delivering the lens. In the writer's experience it occurs more frequently from the section being too small, from minus tension, from failure to open the capsule, and from failure to make the requisite pressure on the posterior lip of the section while pressure is made from below the cornea in order to cause the lens to engage in the wound. In the simple operation where the pupil seems rigid, the delivery is aided by stripping back the edge of the pupil over the presenting lens, which then engages it. If this manipulation does not succeed and vitreous presents or escapes, a scoop or hook should be passed into the eye and the lens delivered. The writer prefers a sharp hook; it is smaller, more easily introduced and when the point is engaged in the hard nucleus it cannot slip away as is so likely to happen when a scoop is used.

When plus tension is present or the normal tension for the individual is high, the section should be made slowly so that the aqueous does not gush out, the iris prolapses, and the lens escapes too quickly. I have never had a hæmorrhage into the vitreous or a serious hæmorrhage of any kind and am disposed to attribute this good fortune to the attention given to preventing too rapid delivery of the lens by holding it back with a scoop or wire loop. This simple manœuvre has seemed to be of good service in the cases where it has been tried. The writer understands that this suggestion is not new, but is of sufficient importance to be emphasized.

Some years ago this accident happened in operating on a stout, well developed soldier, who had a round, red face and prominent eyeballs with apparently too diverging axes of the orbital cavities such as I have described under the causes for loss of vitreous earlier in the paper. He began squeezing on completion of the iridectomy, the speculum was securely locked and did not yield. His face became intensely livid and his eyeball advanced until the upper blade of the speculum sprang the wound; the lens was forced out in the capsule and the vitreous body followed. Of course the eye was lost.



Two years later, the other eye was operated under general anæsthesia and made a good recovery with vision equal to  $\frac{20}{30}$  with correction. In this class of cases and in all others where the patient from nervousness, fright or disease, has not good control of himself, a general anæsthetic should be given.

In all cases of hypermature cataract and in all other cases where loss of vitreous is threatened or has already occurred, the assistant is trained to take hold of the speculum at its end and elevate it and the eyelids from the globe. This is a favorite method with the writer and has served him well in several emergencies.

Two years ago while operating before some invited guests of our state Medical Society, the writer met with an unusual accident. The abscision of the iris, as he thought, was completed. This proved not to be so, a small tag remaining unseparated. In the withdrawal of the forceps one-half of the remaining iris was torn away from its ciliary attachment. It was drawn out and abscised and the patient made a good recovery—vision equal to  $\frac{3}{10}$  with +12.

Some years ago in making a double operation on an old gentleman with hypermature cataracts, by the combined method, the nuclei could not be delivered and were given up as lost. In the first eye a thin and attenuated nucleus came from under the upper lid with the speculum where it had been carried by the gush of milky cortex. In the second eye the nucleus was taken from under the upper lid where it gave rise to the feeling of a foreign body after the bandage had been applied.

One of my patients was a gentleman from the center of our state whose right eye had been operated upon and lost from suppuration. At that time making a preliminary iridectomy was thought to be the proper procedure when the cataract was immature. The incision was made with a large triangular keratome, and a medium sized segment of iris abscised. After five days he returned home, a distance of seventy miles, by train. In a few days a letter came stating that he had had severe pain the night before, which was better at the time of writing, but that there was considerable tearing of the eye and a feeling as of a foreign body under the eyelid. He was directed to come down immediately.

He drove six miles in a buggy, returning here by train, and then walked two blocks to my office. When the lid was raised it revealed the corneal incision opened by the pressure of the swollen lens which was well engaged in it. At the hospital all that was needed for the delivery of the lens was clipping each angle with the scissors. The patient made an uneventful recovery; the vision was equal to  $\frac{20}{40}$  with correction. There was no history of injury to the eye while at home, but what probably occurred was a small injury to the capsule from the point of the keratome or from the forceps in catching the iris. The swelling of the lens followed, the tension became plus, the wound sprang open and practically spontaneous delivery of the lens occurred.

Complications are usually post-operative, but not always so. A distinction can be made between those that complicate the operation and those that complicate and delay the healing and recovery afterward. It is not always possible to differentiate between an accident and a complication. For our purpose, however, it is desirable to make a distinction between them, and we have tried to do so not by hard and fast lines but rather by grouping together in their order of occurrence and importance the different conditions that enter into and determine the outcome of the case. Of the conditions that complicate the operation we may group under corneal opacities every form of disease that affects its transparency, reserving for some later remarks, infective processes that follow operations. Under diseases of the iris synechiæ, occlusion and seclusion of the pupil, and later on we will speak of infective processes which sometimes follow. Under diseases of the lens hypermaturity, dislocation and thickening of the leaves of the capsule and friability of the zonula; under diseases of the vitreous, fluidity, opacity and infection. Under diseases of the retina and choroid we may include high degrees of myopia and retinal detachment and the various forms of inflammation met with in Bright's disease, diabetes and leukæmia.

If delirium and hallucinations are present, we remove the bandage, and if atropia is being used, stop it and give sedatives. Fright requires comforting assurance; paralysis agitans will sometimes require an anæsthetic. If an attack of



epilepsy occurs during the operation, an anæsthetic will be required to complete it.

Of the conditions that delay and complicate the healing, the most frequent is iritis; in varying degrees of intensity it is present in at least one-half of all cases, at some stage of the healing. It is generally of a mild type and yields to atropia, dionin, hot water and leeching. Occasionally it is of a severe type and an exudate is thrown out which closes the pupil or coloboma. If the patient is syphilitic, it will probably be absorbed under appropriate treatment. If rheumatism or gout are present, large doses of sodium salicylate and colchicum will usually relieve the pain and cause its absorption. If we fail with this, it will become organized and must be dealt with surgically to secure an opening through it. Opacity of the capsule from irido-capsulitis occasionally occurs and requires the same surgical treatment. Pain coming on during night, ten or twelve hours after the operation, at a time when all smarting due to it should have ceased, is a very suspicious symptom, and usually means infection of the wound, due in the vast majority of cases to undetected or overlooked lacrimal disease. Infection means auto-infection nine times in ten. Sympathetic inflammation is a complication that we have not met. Delayed union has been seen several times. We have had one case go fourteen days and heal without other treatment than the bandage. The writer believes that much anxiety and useless meddling would be avoided by letting this complication alone as a rule of practice, to which there may occasionally be exceptions.

Astigmatism is a common complication, varying from 3 to 20 diopters immediately after the operation, to about 1 diopter in a few months afterward. If the incision has been made with a sharp, keen knife, primary union occurs and the degree is low; if, however, the knife is not sharp, the incision will be ragged and the inflammation may occur and healing with higher degree of astigmatism may result, or high tension may come on and spring the wound and cause the iris to prolapse or a tag of capsule to insinuate itself in the wound and a high degree of astigmatism will result. Nature offers all the relief we can hope for in this condition, after the prolapsed iris has been abscised and proper glasses have been given.



Septic infection, next to hæmorrhage into the vitreous, is the most serious complication that can arise. It usually starts in the corneal incision, which becomes infiltrated. The edges may slough and, if the infection is intense, it may spread to the whole of the cornea. Or it may start as an infection of the iris (suppurative iritis), or as an inflammation of the vitreous body (suppurative hyalitis)—suppurative retinitis or choroiditis may also occur; but these are never primary diseases after an operation, as I understand it.

The writer has met with one case of fistulous healing. It followed a simple extraction in which the prolapse was also abscised within twenty-four hours; yet it resisted all attempts at healing, and persists to this time.

A great deal is being written now about the power of cocaine to cause in old persons softness and collapse of the cornea, and thus to complicate the operation of extraction. As pertinent to the question, and also bearing on the matter of priority in observing this property of cocaine, I beg to submit the following record from the eye-ward of the National Military Home, December 10, 1884, which the writer dictated. "Wm. H. Hood, K. 5th, U. S. C. T: Cataract extracted under cocaine hydrochlorate anæsthesia; two or three drops of the 2 per cent. solution were used at intervals until eight drops were used in twelve minutes, at the end of which time the operation was performed without pain. After the aqueous humor escaped the cornea collapsed, becoming funnel shaped and causing the extraction of the cataract to be very difficult, and after the operation was completed, the anterior chamber did not fill as it usually does, and had not filled when the bandage was applied; but next day the aqueous had filled the chamber and the case looked very hopeful. It is a question whether hydrochlorate of cocaine did not cause this collapse."

The writer has not tried to present a statistical report covering accidents and complications, but has simply related his personal experience in treating and avoiding the more important ones, as he has met them.

Convinced that some of the most valuable, lasting and helpful acquisitions to our knowledge have come, and must still come through personal experience, he respectfully submits the paper as a small contribution to that end.

## DISCUSSION ON

## THE LENS CAPSULE IN OPERATION FOR CATARACT,\*

BY DR. H. KNAPP,

AND

SOME OF THE ACCIDENTS AND COMPLICATIONS MET WITH  
IN CATARACT EXTRACTION,

BY D. W. GREENE.

DR. JOHN E. WEEKS (New York): The subject of cataract extraction and the treatment of the capsule is so extensive that detailed discussion would occupy much more time than we are permitted. I shall therefore speak of but a few points. In regard to the incision, I infer from a synopsis of the paper first read that the author's incision is corneal. I think the incision that gives the best result is the incision made in the vascular portion of the eye—the limbus, and the making of a conjunctival flap. Another point is the removal of a portion of the capsule. I fully agree with Dr. Knapp that the removal of the anterior portion is difficult and apt to cause complications. I have tried a number of instruments for this purpose, but none have been perfectly satisfactory. In regard to the capsulotomy, I think that the method of opening the capsule advocated by Dr. Knapp is extremely good, but it is not free from objections. The capsule is not infrequently torn by the lens as it escapes and you do not get a simple linear incision in all of the cases. As Dr. Knapp has said, wherever the capsule is opened there is a scar and thickened line which makes the subsequent capsulotomy relatively difficult. If we can get an opening which will lay bare the posterior portion of the capsule, as is often accomplished by the Graefe capsulotomy, subsequent operation, if necessary, is comparatively easy and simple. In many cases a secondary operation ("needling") is not necessary. Where the margins of the torn capsule come in contact with the iris there is apt to be an adhesion—posterior synechia. As a rule this amounts to nothing, but it is advisable to prevent it as much as possible.

With regard to the combined or simple operation, it has often occurred to me to put the question to myself, if I had a cataract, which operation would I select? I think that I

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\* See September number of this journal.



should select the combined operation. A large experience with both methods has led me to believe that the complications that may follow the simple operation are more serious than those that may follow the combined operation.

DR. EDWARD JACKSON (Denver): For several years I have done the opening of the capsule in this way: After completing the corneal section, if I intend doing simple extraction, or after turning down the conjunctival flap from the cornea—for I aim to get some flap at the center—I dip the cataract knife into a pitcher of boiling water held by the nurse at my elbow, then introduce the back of the knife into the corneal section, drawing it back toward the point of original puncture. After an iridectomy, added space is secured by the iridectomy; but in even simple operation, with a small pupil, it is not difficult to do this. Bring the knife to the side of the pupil nearest the original corneal puncture, allow the back of the knife to press on the iris and retract it some distance; then make a puncture in the lens capsule with the point of the knife. Carry the point of the knife forward to the other side of the pupil and even cut the capsule back of the iris, without injuring the iris. Withdraw the knife, and that completes the opening of the capsule. I first undertook this method of opening the capsule fearing that the result of such a manœuvre would be an inadequate opening, that the capsule would offer resistance to the extraction of the lens. I never have been conscious of the slightest resistance after such an incision except in two cases in which the cataract was hypermature and the capsule unusually thickened. Whether the incision splits from the ends and extends out to the edge of the lens, or whether the stretching is sufficient to permit of the nucleus passing through it I cannot say; but the fact is that after such an incision, which is not difficult to make, the lens comes out without difficulty. The results have been all that Dr. Knapp has claimed for his incision. It is of the same kind, but not quite so peripheral as his. There are sometimes adhesions at the points where the incision would cross the pupil, but they give very little trouble, and the scar, if there is a noticeable one, is out of the way of the central pupillary region. I am sure that the number of cases requiring a secondary operation has been rather smaller since



I adopted this plan. Some of the cases have been watched from time to time during ten years. I have operated upon something like 300 cases by this method. I have not encountered any serious difficulty, and the results have been a capsule that is easy to deal with if it requires subsequent attention.

DR. A. A. HUBBEL (Buffalo): My experience has now been sufficient to warrant me in saying a word on this subject. It is an important one, and none of us, in five minutes, can discuss any part of it fully. I wish to speak, first, as to the manner of making the incision. I believe that the original incision of Daviel is ideal, except that he made it downward instead of upward. It is made directly in the corneo-scleral junction, and should be large enough to give easy egress to the lens. I do not like to go back into the conjunctiva very much, because there is thus a liability of getting hæmorrhage into the anterior chamber, which adds to the difficulty of properly opening the capsule. The question has been uppermost in my mind for a number of years as to whether I should do the simple or combined operation. Of course all of us have been tempted to do the simple operation, but it has its drawbacks, and to my mind they are in excess of those of the combined operation. I agree with Dr. Weeks, that if I had a cataract and it was to be removed, I should prefer to have it done by the combined method. I wish to call attention to the method of "button-holing" the iris, practiced by the surgeons of the Massachusetts Eye Infirmary of Boston. The operation is done after the simple operation is completed, when, with a delicate forceps the iris is grasped as near the periphery as possible and a small fold is brought out and excised—the smallest possible portion. I have been doing this during the past summer, and, while my experience has not been large, it is very satisfactory. It is somewhat difficult to do, as the patient's eye must be still, and as it is not easy to limit the amount of iris to be excised. I believe the prolapse of the iris in simple extraction is due more to the pressure of the aqueous humor from behind than to any other cause. This button-hole operation leaves an opening through which the aqueous passes, and it does not collect beneath the iris to press it out before the union of the corneal wound takes place.

The treatment of the capsule is another important subject, and much might be said in regard to it. I have tried Dr. Eugene Smith's capsule forceps, but I have not been very successful in using them. The fault is doubtless mine. I have tried Dr. Knapp's and other methods, but have come back to making the T-shaped incision of Graefe, as described here to-day. After the lens is extracted, irrigate the anterior chamber according to the method recommended by Lippincott of Pittsburgh. I have used his treatment for two years and I believe that increased success will come from practicing this or some other method of irrigation. It is done easily, the lens and blood-debris is thus removed, and little is left to produce opacities, or to cause irritation and inflammation.

DR. EUGENE SMITH (Detroit): The method of button-holing the iris has been used a hundred years more or less. It is a simple thing to remove the anterior capsule; I have been doing it for twenty years in every instance. As it has been remarked, we not infrequently deliver the entire lens in its capsule, and without loss of vitreous when the capsule is thickened. In regard to Dr. Knapp's forceps, it is a little difficult to make them bite; the blades come together, and if you are not careful you will pinch up a fold of the iris. The teeth should come together and yet leave a little opening between the blades as in my forceps. I prefer a little drop to the portion of the blades containing the teeth. They drop into the pupillary space while the blades are on a plane with the iris. I have examined the capsule extracted with the microscope and have observed that it measures 3x5 mm. I have never seen a lens dislocated. There is no necessity of making such deep pressure. I have had to make dissection of the capsule in less than 3 per cent. of my operations. I have had the little adhesions that you are bound to have with whatever operation you make. You will get posterior synechiæ—you cannot help it. Regarding the prolapse of the iris, I read a paper at the last meeting of this Academy regarding the hypodermic use of morphia after operation. I have used it for fifteen to eighteen years, and I have operated on many cases. I prefer the simple extraction in suitable cases, but always in my simple cases the hypodermic injection of morphia,  $\frac{1}{8}$  of a grain every three hours until



three doses are given. I use eserine also when finishing the toilet. I am a strong advocate of the use of capsule forceps, and morphia in simple extraction. I use the capsule forceps in all cases.

DR. ALBERT R. BAKER (Cleveland): I wish to add my testimony in favor of the peripheral capsulotomy of Dr. Knapp, which was the first one I made and the last one. I have tried the capsule forceps of Dr. Smith, and I think I have tried them all, but I find that after a few trials I go back to the peripheral opening of the capsule of the lens. I do not see that I have to make any more secondary operations when I make the incision than when I make any other.

With regard to accidents, the escape of vitreous is the one I have always feared the most, and have frequently attributed it to the awkwardness of my assistant. To avoid this difficulty, I adopted several years ago a plan of operation, which is not original, and that is of discarding the speculum and grasping the superior rectus above the cornea with the fixation forceps instead of below, thus holding the upper lid out of the way with my forceps. It is surprising how easily and how accurately the incision can be made with almost no fear of escape of vitreous from pressure or pulling upon the eyeball by assistant or squeezing the lids together on the speculum by the patient.

DR. JOSEPH E. WILLETTTS (Pittsburgh): It seems to me that the best operation is that operation by which the lens may be extracted in the quickest possible time, with the least interference to the eye. This is unquestionably accomplished by the simple extraction. I have been present at some fifty odd consecutive operations by Dr. Knapp, in which the lens was extracted by the simple method, the capsulotomy being peripheral; and since that time I have advocated the simple extraction and operated by that method exclusively. I prefer the incision through the corneo-scleral margin. The capsulotomy which Dr. Knapp recommends, I do not like, probably because I am not as fond of doing dissections as he is. I make a central capsulotomy, crucial in shape. It seems to me it is bad surgery to do a preliminary iridectomy, when it is not essential to results to be obtained, and it is equally bad to do peripheral capsulotomy, which almost invariably



necessitates a discession. I am not in favor of subjecting an eye to three distinct operations, where one suffices.

DR. HERMANN KNAPP (closing discussion of his paper): (Dr. Knapp illustrates at the blackboard). When you look sharp at the exit of the lens through the pupil you see that the edge of the iris is notched, but the little angles disappear when the lens is out. These little ruptures of the iris come in contact with the shreds of the torn capsule of the lens and produce synechiæ. When I was in Vienna years ago, Prof. Arlt said he had never seen them, but when I looked at his patients with oblique light I found that there were a number of them, and he said, "Yes, they are agglutinations and have nothing to signify." When these ruptures of the iris come in contact with raw surfaces of the shreds of lens capsule we get the adhesions. If the lens comes out in its capsule, we notice no synechiæ, but we find them regularly if the anterior capsule is miscellaneously ruptured with a cystotome or other instrument. The synechiæ, I think, are ever inflammatory. Under all conditions they are better absent than present. In order to avoid them, I have for many years placed the opening of the capsule to the periphery of the capsule, about 1 mm. in front, and parallel with the corneal section. This keeps them off nearly always. Another advantage is that the anterior and posterior capsules agglutinate and are free from inflammatory thickenings, so that the capsulotome can split it easily, with better permanent acuteness of sight.

DR. GREENE (closing discussion of his paper): I have not much to say. In regard to the incision Dr. Weeks speaks of, I have tried to make it as seen in Paris—a corneal section starting well back. I have never made a conjunctival flap. I have never seen cases where I thought it would do good. The extraction of the anterior capsule is easy. I saw Fuchs do it in 1888 and have seen many since, and it is very easy I know of nothing easier. I have a record of 150 operations after I had studied at the feet of Dr. Knapp of New York, after his method. I do not like it, and abandoned it because of the necessity of needling that followed. All the cases of glaucoma I have had, excepting two, have followed needling. I dread the needling more than extraction, so far as glaucoma is concerned.

## ABSTRACTS FROM MEDICAL LITERATURE.

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BY W. A. SHOEMAKER, M. D.ST. LOUIS, MO.

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## THE TREATMENT OF PURULENT CONJUNCTIVITIS.

Miles Standish (*Jr. A. M. Ass.*, Dec. 17), from a study of the records of the Mass. Charitable Eye and Ear Inf., presents the following conclusions:

1. That the newer silver salts are more easily applied, safer in use and produce better results than nitrate of silver.

2. That in cases of ophthalmia neonatorum either protargol or argyrol is an entirely satisfactory agent.

3. That in cases of gonorrhœal ophthalmia in the adult, the results obtained when treatment is begun early are approximately the same with either preparation, but when once the cornea is involved, protargol appears, in these cases at least, to have offered a better ultimate outcome.

4. That the application of cold during the stage of swelling in gonorrhœal ophthalmia is a dangerous procedure and should be abandoned.

## EYESTRAIN.

Lewis S. Dixon (*Jr. A. M. Ass.*, April 22) urges the importance of giving the eyes rest, which can be done in emmetropic eyes by looking off at a distance. The hypermetropic eye can not thus rest, however, because it must accommodate to see clearly at any distance. Muscles are not rested by removing part of the burden they bear, but by being allowed to relax completely. This the hypermetropic eye cannot do so long as the eyes are open. Hence, in many cases of eye strain, complete relief is gotten only by correcting all of the hypermetropia and having the patient wear the correction for distant as well as near vision, as not until this is done do the ciliary muscles get a chance to relax entirely.

Dixon holds that, contrary to general opinion, it is better in these cases to slightly over correct than to under correct the hypermetropia. The thing sought for should be, not clear distant vision, but ability to use the eyes with comfort.



## PRESBYOPIA.

E. J. Gardiner (*Jr. Am. Med. Ass.*, Dec. 17) contends that, owing to a prejudice based on either vanity or ignorance, the wearing of presbyopic glasses is deferred too long, at the expense of comfort, efficiency, and often the health of the eye. He thinks the prejudice should be overcome, and that properly adjusted glasses for close work should be worn as soon as the amount of accommodation is so reduced that it requires an effort to see distinctly without the aid of glasses.

## RELATION OF DISEASES OF THE EYE TO THOSE OF THE TEETH.

W. M. Carhart (*Med. Review of Reviews*, Feb. 25) notes that the same periosteum which lines the orbital cavity extends to the alveolar border of the upper jaw; the mucous membrane of the mouth is in direct continuation with the conjunctiva. Often the roots of the upper teeth extend directly into the antrum of Highmore, from whence disease frequently reaches the orbit through the thin partition of bone. The angular artery and certain veins run almost directly from one region to the other. The same general nervous supply reaches both, not only through the fifth pair, but also through the sympathetic system. Hence, it is not difficult to understand the closeness of the relation between diseases of the eye and teeth.

He quotes Wendell Reber (*Ophthalmology*, Vol I, No. 1) as offering the following conclusions:

1. The ophthalmologist should seek the assistance of the dental surgeon in all cases of unexplainable paralysis of the accommodation, dilatation of the pupil, palsy or spasm of the external ocular muscles, rebellious corneal ulcers, phlyctenular disease, lacrimal fistula, orbital cellulitis, abscess, caries and periostitis, and in threatening glaucoma without apparent cause.

2. The dental surgeon should refer to the ophthalmic surgeon patients that develop any ocular symptoms whatever, and in particular those exhibiting altered pupils or accommodation, lowered vision, painful eyeballs and swollen lids or orbital margins with prominence of the eyeball. The latter is particularly important, as pus in the orbit will almost invariably do some damage.



3. From two to ten days is the time wherein infection from an alveolar wound is most likely to take place.

4. The so-called reflex affections (traumatic hysteria) may occur at almost any time within six months after an extraction. Impressionable females are the likeliest subjects for the development of this puzzling phenomenon.

5. Eye-strain in certain diseases of the eye may give rise to neuralgias reflected along the dental branches of the fifth nerve, and thus make it appear as though the teeth were the primary offending cause.

6. The small and the first great molar most frequently provoke the process that later involves the antrum of Highmore, the lacrimal sac, and even the orbit.

7. As Garretson has well said: "A diseased tooth may express itself in almost any part of the body, while, on the other hand, disease in any part of the body may express itself in discomfort through a tooth."

#### THE TREATMENT OF TRACHOMA BY MEANS OF RADIUM.

J. V. Zeleukovski (*Roussky Vratch*, May 14) reports his experiments of treating four cases of trachoma with radium. They were pronounced cases, with typical granulations, which usually would be submitted to operation.

One milligramme of radium, sealed in a thin glass tube, was slowly moved over the mucous membrane of each lid, barely coming in contact with it, for a period of five or ten minutes. Eight to fourteen applications were made, and no other treatment was given. Of seven eyes treated by this method, five were permanently cured and the other two were rapidly improving. The granulations disappeared without leaving any scars or other evidence of their former presence.

The author believes that radium is very useful in the treatment of this disease, and that no danger attends its use if the amount of radium and the length of the exposure are properly regulated.

#### SUBCONJUNCTIVAL SALT INJECTIONS.

S. D. Risley (*Jour. Am. Med. Asso.*, Aug. 12), after reporting a number of cases taken at random from those in which he has used this treatment, discusses the mode of operation. He has found material improvement to follow

saline subconjunctival injections in cases of abscess of the cornea; interstitial keratitis; vascular keratitis, with iritis; high myopia, with atrophic choroiditis, macular hæmorrhage, and commencing separation of the retina; as well as in other groups of cases.

He discusses the different theories as to how injections do good, and concludes that probably by rapidly dilating the channels of exit and diluting their contents, the flow of lymph is assisted through the normal channels, and that once emptied of their contents these channels are quickly filled with lymph richer in albuminoids derived from normal sources, which would thus better nourish the tissues. It has been observed that the prolonged use of saline stupes, or of solutions of crystalline substances, if they come in contact with the conjunctival sac, also do good; and the question has arisen in Risley's mind whether, perhaps, the collyriæ, i. e. solutions of alum, borax, zinc salts, etc., that have been found of material service in many cases, may not act by osmotic diffusion, thus causing a dilution of the contents of the lymph channels.

#### OBSTRUCTION IN THE RETINAL ARTERIES.

Allen Greenwood (*Jour. Am. Med. Asso.*, March 11) says the three most frequent causes of obstruction in the retinal arteries are arterial disease, embolism, and spasm. Thrombosis in a healthy retinal artery is a very rare occurrence, while in the pathological conditions mentioned it is rarely absent. Arterio-sclerosis, occurring as part of a general degeneration of the arteries, is perhaps responsible for more cases of obstruction of the retinal arteries than any other cause, although its importance is not always recognized and the actual condition is frequently overlooked. The ophthalmoscope shows a slight increase in the reflex from the arteries, with irregularities in their size, and where an artery crosses a vein the latter is often compressed, dilating it at the distal end, and more of the vein is hidden than the apparent width of the artery, showing that the latter has thicker walls than usual. The discs are often slightly congested and a feathery outline is observed, with a feathery exudate beside the arteries. If the central artery in the nerve is thickened, it often imparts a pulsation to the veins

which can be seen with the ophthalmoscope. When these conditions are found, they should warn us of advancing arterial disease. As the disease progresses the picture changes and lesions in the retina appear, caused by small arterioles becoming so sclerosed that their lumen are occluded. The part of the retina supplied by these vessels not being properly nourished, a local œdema occurs, with subsequent degeneration; or the weakened, diseased vessel walls give way and we have retinal hæmorrhages. In this stage we may have the appearances of the early stages of degenerative albuminuric retinitis. Often the kidneys are involved, and at other times arterio-sclerosis effects the eyes with no apparent involvement of the kidneys.

Embolism of a retinal artery is usually associated with diseased heart valves or a heart thrombus, although it is possible for it to be caused by a globule of fat getting into the circulation, following fracture of the tibia or femur, or by a foreign substance introduced into the circulation, such as paraffin injections used in reducing nasal deformities, etc. In any of these cases there is sudden loss of sight with the fundus changes described by Graefe.

It is now fairly well proven that spasm of the retinal arteries may be marked enough to obstruct the flow of blood. This condition is most likely to occur where endarteritis exists. For this reason a permanent occlusion of the vessel may take place after repeated temporary obstructions by spasm, as occurred in Wagenman's classical and frequently observed case.

The treatment of retinal arterio-sclerosis consists largely in regulating the patient's habits, avoiding nerve strain and all excesses. Medicinally, iodide of potash should be given in small doses for a long time.

In embolism, nitroglycerine should be given internally and the eyeball massaged, if seen shortly after the outset of the trouble.

Where spasm occurs nitrite of amyl may be used to abort them, and the treatment outlined for arterio-sclerosis should be carried out to prevent, if possible, the permanent occlusion of the vessels.



## BOOK REVIEWS.

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MANUAL OF DISEASES OF THE EYE. By CHAS. H. MAY. 4th Edition. With 400 pages and 21 colored plates. William Wood & Co., New York: 1905. Price \$2.00.

The rapidity with which a new edition of this handy and very commendable manual has become necessary, must surely be gratifying to the author. This, the 4th edition, is brought up to date, and it has numerous new illustrations to elucidate the subjects treated on.

REFRACTION AND HOW TO REFRACT. 3rd Edition, with 215 illustrations. By JAMES THORINGTON, A.M., M.D. P. Blakiston's Sons & Co., Philadelphia: 1904. Price \$1.50.

This new edition of Thorington's work has some valuable additions which render it more useful than its predecessors. It handles the whole subject of refraction clearly and exhaustively and teaches the student in a plain manner how to go about in order to measure the refraction of the eye successfully.

MANUAL OF PRACTICAL OPHTHALMOLOGY. By G. A. BERRY, M.B., F.R.C.S., Ed. With 223 illustrations. J. B. Lippincott Co., Philadelphia: 1905.

Berry's manual on ophthalmology adds one more to the list of excellent and practical text books which are at the disposal of the student. While not remaining silent on the opinions of others, the author lays especial stress on his personal experiences in the treatment of eye diseases. The illustrations, though in black and white only, are excellent. The name of the author is a recommendation in itself.

L'OEIL ARTIFICIEL (The artificial eye). By DR. ROBERT COULOMB. 27 photographic plates and 123 figures. J.B. Baillière et Fils, Paris: 1905.

A most interesting book. After having given the history of artificial eyes in ancient and modern times, including the modes of manufacture, the author devotes considerable space to the adaptation of the artificial eye, its best shape, to the methods of forming a good and serviceable stump and orbital cavity. The many excellent illustrations add greatly to the

book, which throws much light on a chapter in ophthalmology which is only too often neglected by the ophthalmic surgeon. A study of this scholarly treatise will amply repay the reader.

**ZUR KROENLEINSCHEN OPERATION (on Kroenlein's Operation)**

By DR. JOSEPH HELBRON. With 2 plates. Berlin, 1905: S. Karger. Price 3.50 mark.

In this paper, which comes from the Eye Clinic of Prof. Michel in Berlin, the author gives a detailed description of Kroenlein's operation for the removal of tumors and foreign substances from the orbit, and of all the modifications this operation has undergone in the hands of other surgeons. He describes its results in a large number of cases of his own and those published by others, 62 in all. In summing up he recommends Kroenlein's operation as indicated in order to attack all disease foci in the temporal half of the orbit, but more especially in order to remove cysts, cavernomata, tumors of the lacrimal gland, slow growing solid orbital tumors, tumors of the optic nerve, foreign bodies in the orbit, etc., and even for diagnostic purposes.

**BIOGRAPHIC CLINICS. Volume III.** Essays concerning the influence of visual function, pathologic and physiologic, upon the health of patients. By GEORGE GOULD, M.D. P. Blakiston's Sons & Co., Philadelphia: 1905.

This, perhaps the most interesting, third volume of Gould's biographic clinics, contains a number of papers by him, previously published, to which one by Simeon Snell and one by C. E. Pronger are added. They detail the influence of eye-strain on the general system, as do the former ones. Especial space is given to the influence of eye-strain on the production of scoliosis in school children. This chapter is particularly interesting and useful.

It seems a pity that what is true and undoubtedly good in the author's contentions, according to his statements, appears to be unappreciated by the majority of oculists and medical men. This is probably not the case. That we cannot all of us go the whole length with him, is undoubtedly true. Nevertheless, nobody can read the author's earnest appeals, which bear the evidence of his convictions, without benefit.

ALT.

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## ORIGINAL ARTICLES.

### FILARIA LOA.\*

By DERRICK T. VAIL, M.D.

CINCINNATI.

ENTOZOA affecting the human eyes are rarely encountered in America, and of these rare guests the most unusual and in many ways the most interesting is the filaria loa. Henry B. Ward, Professor of Helminthology, University of Nebraska, writes me that in over one hundred references which he has carefully searched, he has found but one case where the parasite was actually extracted within the confines of the United States. My case is therefore the second on record in this country. It is claimed that there is only one small section of the world which produces the worm in question. My case was infected in that locality.

The patient, Mrs. A. B. Lippert, Westwood, Cincinnati, whose husband, Dr. A. B. Lippert, is a medical practitioner and missionary in western Africa, 135 miles from the west coast, in the equatorial region, in the country called Kamerun, first consulted me in August, 1901.

History: While residing in Africa in 1899, the patient one day noticed a prickling sensation in the right eye. The

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\*Read at the 10th annual meeting of the American Academy of Ophthalmology and Oto-Laryngology, Buffalo, Sept. 14th to 16th, 1905.



sensation was annoying, of the nature of an acupuncture, very positive, causing her to consult her husband at once in regard to it. Examination revealed the bulbar conjunctiva to be somewhat injected on the temporal side and the Doctor noticed a vermiform movement under the conjunctiva external to the sclera, looking very much like a worm crawling under the conjunctiva. At times the movement would cease for a few minutes, to be shortly resumed, "seeming very much like a snake forcing its way through a tangle of grass." In two hours time it had moved off the ball of the eye and escaped in the connective tissue at the outer canthus.

Her husband having heard that "eye worms" were common in that section of country, prepared some instruments for use in case the entozoon would manifest itself again. Two days later the same symptoms occurred in the left eye. The Doctor distinctly saw the worm crawling across the sclerotic of the left eye rather rapidly, and by the time he had the cocaine and instruments ready it had escaped. Within half an hour it appeared again in the upper eyelid between the skin and the tarsus. He made an incision with a knife over the point of greatest movement and succeeded in extracting the worm by means of dissecting forceps. Six months later another worm appeared in a similar position under the skin of the upper eyelid of the right eye. This time the knife severed the worm near its middle and one-half was extracted, while the other half remained in the tissues. The latter did not move afterward, but left a small nodule in the tissues which one can still see.

Three months after this a worm appeared in the neck over the sterno-cleido muscle on the right side, and could be distinctly seen. The operation was similar in technique, and the worm was extracted. And again, eight months afterwards, a worm was felt and seen in the left mamma, about an inch above the nipple under the skin. This was attacked in the same manner, but was severed and one part removed, with no evidence of what ever became of the remaining part. On another occasion one was felt and seen at the angle of the scapula, but the instruments not being at hand, the worm made its escape.

On various occasions single worms were felt in the eyelid

and on the eyeball, her husband removing four at various times, but all were between the tarsus and the external skin of the eyelid. The patient remembers distinctly that the left ankle was affected with a worm, which produced considerable inflammation and œdema; and at the same time the right wrist was similarly affected, but the worms did not come to the surface, and both made their escape. The swelling gradually disappeared, leaving no bad results.

At various and numerous times the patient would feel worms at work near the joints of the body. The patient states that the insertion of a tendon was the principal point of irritation in every instance. Sometimes swelling, tenderness and œdema would accompany the irritation. Within a few hours the worm would be felt to change its position from one extremity of the body—for example, in the ankle—to some remote region like the wrist, of the other side of the body. At times the patient could trace the course of the worm from the ankle to the region of the ribs. The points of irritation would always be near the head of a bone lying near the skin where the worm passed between.

Examination: On August 9, 1901, the ophthalmic examination was negative; muscular apparatus in good balance; refraction +1.0 right and left; vision  $\frac{20}{20}$ , but patient has considerable asthenopia. There is slight catarrhal conjunctivitis and some blepharitis marginalis. No evidence of any worm was seen about the eyes, excepting the scars at various points, showing where her husband had operated for their extraction.

June 1, 1903. Patient returns, stating that she has again felt these eye worms on several occasions. At times they would be in the eyelids and at other times in the eyeball. Frequently they would be felt about the ankles, the ribs and the wrists. On one occasion she could feel a worm crawling across the sternum. It could be distinctly seen. Her husband being absent at the time, she called her brother, who attempted using a razor, but owing to his untrained surgical ability he only succeeded in making a slight cut, and both patient and surgeon losing confidence, the worm made its escape. She was endeavoring to have him sever it so that both ends would remain quiet and annoy her no further.



On September 17, 1903, while attending to her household duties she felt a worm creeping around on the right eye. Her husband brought her to my office, a distance of five miles, during which time the worm could be distinctly seen moving in the right upper eyelid. Examination at my office at first failed to reveal any evidence of the worm, but as the patient said it would probably manifest itself in a short while, I requested her to remain in my waiting room a few minutes in order to see if it would make itself visible. Before I could get ready to operate, in case the worm manifested itself, I was informed that it was again working near the surface. Examination revealed a distinct, independent movement, like what would be made by a small worm an inch long, crawling about under the skin of the upper eyelid. The movements were slow and somewhat clonic. During one of these contractions I grasped the most prominent loop of the worm by means of fixation forceps and then by means of scissors and forceps succeeded in extracting the worm without its being severed or wounded. It was placed in alcohol at once and carefully prepared for microscopical examination. The next day the Doctor called, stating that another worm had been seen on the other eye in about the same position, but the patient was not able to come to the office on account of the nervousness following the operation of the day before.

Four months later, viz: January 18, 1904, her husband called, stating that his wife could feel and he could see a worm creeping in the skin of the left lower eyelid that morning, but it was not convenient for her to come for its removal. Since last September the patient has felt these worms in various parts of the body.

It has now been two years and eight months since the patient left Africa, and these worms are as active as ever. She declares that she knows of four distinct worms still existing in her body which she feels at various times.

The Doctor is of the opinion that these worms at no time attack the vital organs nor the abdominal or pelvic viscera. They seem to limit their peregrinations to the extremities and especially the tissues about the eyes.

They can almost invariably be felt on chilly days out of season and cold days following a warm spell. If the patient



allows her foot or hand to remain from under the bed covering on a cold night the parasite can be felt.

Her general health is good; the vegetative functions are normal and there is no anæmia or cachexia. The patient does not attach much importance to this trouble, excepting that she is naturally anxious to get rid of it on account of her instincts and sensibilities being shocked.

Manson, in his book, "Diseases of Tropical Countries," has the following to say regarding this parasite:

"*FILARIA LOA* (page 517). This parasite is peculiar to the west coast of Africa, where, in many parts, it is not uncommon—in Old Calabar for example. The male worm measures about 25 to 30 mm. in length by 0.3 mm. in breadth; the female 30 to 40 mm. in length by 0.5 mm. in breadth. Both sexes are filiform, cylindrical, colorless, like fine fishing gut, tapering slightly at the head, more decidedly at the tail. The body is dotted over with minute chitinous bosses. The anus is subterminal. The tail of the male is markedly incurvated and provided with five large papillæ on each side of the anus, and two rather short unequal spicules. The mouth is simple, punctiform and without armature.

"The habitat of *Filaria Loa* appears to be the subcutaneous connective tissue, which it traverses freely. When, in the course of its wanderings, it crosses the subconjunctival connective tissue, and the delicate integuments of the orbit, it becomes distinctly visible. When passing under such thin structures as the skin of the eyelids, or that over the bridge of the nose, or when moving about under the skin of the fingers, the slight elevations it gives rise to, as well as its movements, are sometimes appreciable and may be both seen and felt.

"From the circumstance that this parasite has occasionally been seen in individuals who have been ten or more years away from the endemic area in which alone it can be contracted, we may conclude that the *Loa* is long-lived.

"The female produces embryos closely resembling *filaria nocturna* and *filaria diurna*. At one time I had a negro under my care, in whose blood *filaria diurna* abounded. This man remembered that as a boy he had *Loa* in his eye. On the other hand, Dr. Argyll Robertson has placed on rec-

ord a remarkable case of *Filaria Loa*, in which the parasites, a male and a pregnant female, were removed from the eye. The patient's blood was frequently examined but no embryos were found. Lately I had an opportunity of examining the blood of another patient known to be the subject of *Loa* infection, but failed to find any hæmatozoal embryos. We do not know anything about its life history outside of the human body. Notwithstanding the failures to find the embryo in the peripheral blood, analogy suggests that it probably circulates for a time in this fluid and, like *filaria nocturna*, that it is removed from this medium by some suctorial insect which acts as intermediate host.

"*Filaria Loa*, as stated, is very active in wandering about the body, but it seems to have a predilection for the eyes and their neighborhood. It comes and goes there at irregular intervals of days, weeks or months, traversing the sub-conjunctival tissue, and moving across the bridge of the nose from one eye to the other. Warmth seems to solicit its presence near the surface. The sexes seem to hunt each other about; at all events, in Dr. Argyll Robertson's case (*Trans. of the Ophthalmological Society*, 1895) a male worm was removed from the eye and not long afterwards a female worm appeared about the same situation and was also removed. The worm gives rise to pricking, itching, creeping sensations and occasionally, transient œdematous swelling in different parts of the body. When it appears under the conjunctiva, it may cause a considerable amount of irritation and congestion. There may be actual pain even, associated with swelling and inability to use the eye, and perhaps tumefaction of the eyelid.

"Treatment: The negroes treat *Filaria Loa* in two ways—either by dropping a grain of common salt into the conjunctival sac, which has the effect of driving the *Filaria* away, for a time at least; or they extract it with a sharp thorn, or by some other rude surgical means.

"With proper instruments there is no difficulty in removing the parasite from under the conjunctiva or from the eyelid—that is, if the operator is possessed of the requisite deftness in operating. All that is necessary, on the parasite showing itself, is, after cocainizing the eye, to seize the con-



junctiva with a pair of forceps, taking care to include the worm and the subconjunctival tissue in the grasp of the instrument. Having fixed the parasite in this way, the conjunctiva may be snipped through with scissors; when with the aid of another pair of forceps, and after releasing the first pair, the parasite may be withdrawn. In the case of the parasite showing itself elsewhere, I would suggest that it might be killed, as in the case of the guinea worm, by local hypodermic injection of bichloride of mercury solution (1 in 1000)."

In looking up the subject we find there are many varieties of nematodes, and there is some confusion in classification and nomenclature. Osler in his work on medicine recognizes three species of nematodes under the general term "*Filaria Sanguinis Hominis*."

(a) *Filaria Bancrofti*: the ordinary blood filaria (not the species found in my case). The embryos of this parasite are found in the peripheral circulation only during sleep (sometimes called *Filaria Nocturna*). The adult male worm measures over three inches, and the tail forms two turns of a spiral. The female measures over six inches. This is the species which causes *Hæmatic Chyluria* and *Elephantiasis*.

(b) *Filaria Diurna*: the larvæ resembling those of the *Filaria Nocturna*. The embryos are found in the peripheral circulation, only during waking hours. Manson thinks that the *Filaria Loa* represents the adult stage.

(c) *Filaria Perstans*: only the embryos are known. They are exceedingly small. Manson declares this worm is the cause of the "sleeping sickness" of negroes. There is a papillo-pustular skin disease found in West Africa called "crawl-crawl," said to be due to this parasite.

One variety has been observed in the anterior chamber of the eye of a horse (Turnbull, Phila., *Med. and Surg. Rec.*, 1878, p. 351). It grew to be four or five inches long, kept up a lively motion and at the last report was still growing. A few similar cases are reported where the worm, several inches long in each instance, was extracted and examined minutely.

Another variety of *Filaria* has been observed in the eye of man (loc. cit.).



Nordman of Odessa, as far back as 1830 and 1831, studied these worms, finding them in the eyes of cattle, sheep, pigs, frogs, lizards, fishes, birds and human beings. In fishes he first found entozoa in the vitreous, cornea, iris, retina and crystalline lens. This variety has been named "Filaria Lentis" and "Filaria Oculi Humani." Nordman examined two cataracts half an hour after they had been taken from an elderly man by Prof. von Graefe, in one of which he found two very small "thread worms." One of the two had been injured in the middle so that the intestines had come out of the body and were visible as slender threads. The other was uninjured, of uniform thickness,  $\frac{3}{4}$  line long ( $\frac{1}{16}$  inch), extremely narrow. It was spirally convoluted and dead. A simple intestinal canal, a mouth with visible papilla, a uterus and a prominent anal aperture could be distinguished." (Nordman, 1831, *Mic. Beiträge, z. Nat. d. Wirb. Thiere*, pp. 7, 8). In 1832 he investigated this subject still further and found the same worms in cataracts in several instances (*loc. cit.*). Von Ammon has corroborated these discoveries in a case of cataract which he extracted (*Klin. Darstellung*, Vol. XII).

In a chapter on Entozoa (Norris & Oliver) by Salzman, we find a description of the variety of worms illustrated in my case of filaria loa. I quote the following: "We know but little of the natural history of the Filaria Loa. The Filaria Diurna, that by day is found in the same places in great numbers in the blood of negroes is supposed to be the embryo of the Filaria Loa. It is believed that these embryos are sucked up with the blood of the negroes by the mosquitoes, that they undergo further development in these intermediate hosts, and that they are deposited in the water with their eggs. Water contaminated in this way may cause reinfection of man." He further states, "Its acclimatization is not to be feared, since the conditions favoring its propagation are present only in a circumscribed area of its normal habitat (West Africa)."

In the March number of the *Ophthalmic Record* we find an illustrated review of an article by Ransom on "Manson's Eye Worms of Chickens." The illustrations correspond with those of the true Filaria Loa, but the worms do not live

in the connective tissue as illustrated in my case report. They exist under and around the nictitating membrane in the bird, where they lie coiled, and can be extracted in great numbers. They infect the nasal passages of the fowl later on and cause death. They also cause the eye to suppurate. They are found in this country, especially in Key West, Florida.

I have the privilege of presenting the complete bibliography on the subject, compiled by Prof. Henry B. Ward, Lincoln, Nebraska, who has recently written a work on the subject which will attract widespread attention at home and abroad by all interested in Helminthology.

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## SOME EXPERIENCES WITH ADRENALINE.

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THERE is something very pleasing about the immediate effect of adrenaline upon the eye. It is pleasing to the physician to get such a prompt and visible result from an application, and it is very pleasing to the patient to see an inflamed eye, which he has watched by means of a hand mirror carried in his pocket, suddenly become pale and clear like its unaffected fellow. It also gives him confidence in the mysterious power of his physician over disease. On both sides, physician and patient, the effect is fine.

I think some such motives have influenced many of us in the use of this drug. There are, however, good reasons for its use, and there are certain bad effects from its use. I experienced the latter from the use of its equivalent, suprarenal extract, a little over eight years ago, in the early days of this class of drugs, which made me feel that they were very dangerous and resulted in my abstaining from their use till a short time ago, and I am very careful in the use of its successor, adrenaline, at present.

Adrenaline has a very positive effect in prolonging cocaine anæsthesia and in controlling hæmorrhage in operations about the eye; also in controlling hæmorrhage, and producing anæsthesia used with cocaine hypodermatically, in operations involving removal of tumors, and in plastic operations.

I have also found that in eyes where, on account of conjunctival congestion, cocaine was not absorbed, or atropia did not dilate the pupil, the use of adrenaline, by diverting the blood from the conjunctival vessels and producing an ischæmic condition of the tissues, would result in the absorption of these drugs and in their producing their normal effects.

In the treatment of hay fever conjunctivitis, I have found adrenaline, added to the usual treatment in such cases, of great benefit, the patients telling me that the attacks were prevented, cured or made much less severe than usual, and they consider me quite a hay fever doctor. I think it is possible that through the tear ducts portions of the affected mucous membranes are reached, which the treatment of the



rhinologist does not touch. In this connection I would add, that in anæsthetizing the nasal duct for the passage of probes, I have to avoid the use of adrenaline in some persons, as its use with them is always followed by a severe headache, which from their description seems to be similar to that caused by closure of the passage from the frontal sinuses into the nose.

My first unpleasant experience following its use—and with my later knowledge I have thought possibly depending on it—was in a case of a young lady where I did a tenotomy with an advancement. The pain during the night following the operation was so severe that it was necessary to give her morphine freely. I have done quite a number of similar operations and this was the only case in which morphine was given.

My first serious result, and the one which opened my eyes to the fact that suprarenaline was not the innocent drug we had thought it to be, but that its use was open to dangers we had not suspected, occurred November 9th, 1898.

A lady from out of the city, 38 years of age, who had been a patient of mine previously, called upon me with a large chalazion, lower lid, near outer canthus, O.D. I used cocaine 5 per cent. and infusion of suprarenal capsule freely before and during the operation. The operation was done in the usual manner, opening and scraping out the sac, and the patient left my office in good condition. This occurred some time in the forenoon.

In the early part of the afternoon, probably two or three hours after using the cocaine and suprarenal capsule infusion, she returned, with intense pain in the right side of her head, veins and arteries in the right temporal region very much dilated, and, as I recollect (I have no note of it), the pupil widely dilated. This latter condition would have been expected as a result of the use of the cocaine.

I will admit that I was very uneasy, and I gave her my undivided attention. I used hot water applications constantly, and at the end of about two hours of unsuccessful effort, I administered five grains of phenacetine, which gave her relief. It was two and a half hours from the time I began to use the hot applications till the patient was relieved.

This experience was a very severe lesson to me, and I dropped the use of the infusion of suprarenal capsule and did not use any of its equivalents for four or five years, notwithstanding the beautiful results which were published by numerous gentlemen, obtained by its use in glaucoma, iritis, etc. I thought I had not talent enough to handle it properly, and that I would depend on remedies that I knew more about.

My second instructive case, which again warned me in regard to its use, occurred recently. Another lady, aged 44 years, whom I have had under my care for glaucoma of the right eye since December 12th, 1904, but, from the history which she gave, the disease had probably existed for several years previously, was doing very well except for an annoying and profuse overflow of tears, with considerable hypertrophy of the conjunctival papillae. This hypertrophy was present on the lids of the left eye also, but to a very slight degree. I believe its excessive amount on the lids of the right eye was due to the irritation from eserine and pilocarpine, which was used in the treatment of that eye. The pupil remained smaller than that of the left eye; tension and vision normal; very slight limitation of the field.

In two cases of excessive lacrimation, from exposure to cold and wind, I had had excellent results from the use of adrenaline  $\frac{1}{1000}$ , followed by zinc sulphate gr. j to  $\frac{3}{4}$  j. From this experience I thought this might be a good line to follow with my glaucoma case. I used it in my office carefully, with no unpleasant effects, for four days. I then (Oct. 2nd, 1905) prescribed adrenaline  $\frac{1}{2000}$ , to be followed by zinc sulphate gr. j. to  $\frac{3}{4}$  j. This was used daily by the patient till October 6th, when during my absence from the city the patient came to my office and was seen by my assistant, Dr. Shahan, and by Dr. Ewing.

Dr. Shahan reported as follows: "Patient used gr.  $\frac{1}{240}$  O.D. this morning and about an hour afterward used adrenaline  $\frac{1}{2000}$  prescribed for her October 2nd, 1905. This was followed 35 minutes later by a dizzy sort of faintness and wide dilatation of the pupils. Used Es. gr.  $\frac{1}{960}$ , with no effect at the end of half an hour. When seen at office, pupil O.D. was still larger than that of O.S., but gradually contracted to size of pupil of O.S., about one and a half hours after



Es.  $\frac{1}{960}$  had been used. O.D. T+. O.S. T. With glasses O.S., everything looked dim.  $V=\frac{20}{24}$ ."

The day following I saw the patient, at which time the "pupil O.D. was the same size as that of O.S.  $V=\frac{20}{12}$  either eye. Es.  $\frac{1}{240}$  (very minute particle, about  $\frac{1}{10}$  of a minim.) produces strong miosis, and reduces the Hm. from 2.5 D. to 1.5 D."

Adrenaline has not since been used, and the case is progressing favorably.

Now I come to my third and last experience, by far the most interesting, of positive value, and I do not know of any similar observations. The patient is a lady, 64 years old. For the present trouble I first saw her the 12th of last May. The record at that time reads as follows: "Two months ago had severe pain in O.D. The first day of this pain O.D. closed." She was confined to her bed for a time, and my report goes on to say, "Yesterday was the first time she has been able to be up all day. Present condition, ptosis, and paralysis of the third nerve O.D. O.D. Hm. 3.5 D.  $V=\frac{20}{15}$  to  $\frac{20}{12}$ . O.S. Hm. 2 D.  $V=\frac{20}{15}$  to  $\frac{20}{12}$

"May 18th: Pupil O.D., about normal in appearance, but does not respond to either light or accommodation. O.D. with + 3.  $V=\frac{20}{30}$  +. Homatropine gr.  $\frac{1}{240}$  dilates pupil O.D. fully, after which ophthalmoscope gives eye ground normal O.D. and O.S."

June 19th, she disappeared. She was under the care of Dr. Frank R. Fry, and her visits to me were only for observation, and were more or less irregular. She seems to have gone home, as she returned to me September 20th, her physician having written Dr. Fry that in his opinion O.D. should be removed, and Dr. Fry had sent her to me with the statement that her trouble was nuclear in origin. My notes read as follows:

"Has had no severe pain, but almost constant dull pain in O.D. since here. O.D. with + 3. D.  $V=\frac{20}{192}$ . O.S. Hm. 3. D.  $V=\frac{20}{30}$  to  $\frac{20}{24}$ . Dilated pupil O.D. with homatr. gr.  $\frac{1}{240}$ ; cornea hazy; some keratitis lower portion.

"September 22nd: Lower portion of cornea anaesthetic and ulcerated."

The local treatment from that time has been cleansing



the eye, the use of antiseptics and keeping the eye closed with a strip of gauze fastened with contractile collodion.

I have gone thus into detail in order that you may be in a position to estimate fully the value of the following observations.

In treating the ulcerated cornea I used adrenaline, followed by zinc sulphate, not noticing the size of the pupil before the adrenaline was used. I noticed, however, after using it that the pupil was larger than the corresponding one. Upon watching the pupil more carefully, I assured myself that the pupil dilated after the use of the adrenaline solution, and this led to my making the following measurements:

December 5th, 1905, I dropped into the eye a solution of adrenaline  $1/2000$ , the same solution that had been used in the case of glaucoma. Before using the medicine the pupil was 3 mm.; one hour later it was 6 mm.

December 7th, thinking that there might be something peculiar about that particular solution, I used a drop from an original bottle  $1/1000$ . Before using the medicine the pupil was 3 mm.; an hour and a quarter afterwards the pupil was 5 mm.

December 9th, I again used adrenaline  $1/1000$  from the same original bottle, making frequent observations in order to get some idea when the maximum effect was produced. When the drop was used, the diameter of the pupil was 3 mm.; 21 minutes afterwards, 5 mm.; 30 min., 5 mm.; 46 min., 5 mm.; 1 hour, 4.5 mm.; 2 hours, 3.5 mm.

I would add that at my request, my assistant used adrenaline  $1/1000$  in at least three cases with normal eyes, producing no mydriasis.

The drug used was solution adrenaline chloride, Park Davis & Co.

## RETINAL CHANGES AS AN AID TO DIAGNOSIS IN VASCULAR DEGENERATION.\*

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WE have in the eye the only organ where a terminal set of vessels can be seen and where it is possible to observe by means of the ophthalmoscope changes in the retinal vessels and capillaries that enable us to detect in many cases alterations that are indicative of disease of the general vascular system. The information thus elicited is important from a clinical standpoint, in that in many instances it is the first inkling of the fact that degenerative changes are taking place elsewhere, and those seen in the eye are only part of a morbid process existing in the blood and bloodvessels of the brain, kidneys and other portions of the body.

It is not my intention in this paper to speak so much of gross lesions occurring in the background of the eye, whether of the retina, choroid or the optic nerve, as to call attention to those slight anomalies that are recognized from time to time and show themselves in alterations in the caliber and contour of the retinal vessels, sometimes so slight that they may be easily overlooked if a careful and diligent study of the background of the eye is not given.

We all know that certain abnormal conditions of the fundus depend for their existence upon pathological changes, usually of a degenerative character, going on in other organs of the body, having for their origin a diseased condition of the blood and bloodvessels. These occur in people who are apparently in good health; nothing of a suspicious nature for one moment leads us to think that anything is wrong until an ophthalmoscopic examination is made when the patient consults the ophthalmologist for some apparently trifling symptom referable to the eye.

We are enabled by closely studying the fundus to detect very slight structural changes in the retinal vessels which

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\*Read at the 10th annual meeting of the American Academy of Ophthalmology and Oto-Laryngology, Buffalo, Sept. 14th to 16th, 1905.

lead us to form conclusions of an almost positive nature that there is a commencing degeneration of the arterial walls which are suggestive of the existence of a similar condition of affairs in the smaller arteries situated elsewhere in the body and signify an arterio-capillary fibrosis.

Tortuosity of the retinal vessels, although one of the earliest phenomena, is not in itself a positive sign unless confirmed by the presence of other variations from the normal which are generally to be found in the early stages of arterial degeneration. These are the alterations in the caliber of the vessels showing inequalities in the breadth of the vessel at various points in its course. The localized contractions in some instances amount to almost total disappearance of the capillary which then regains its normal size; this condition occurring over and over again, giving the vessels a bead-like appearance. At the same time the vascular reflex is broader and brighter and whitish stripes run along the margin of the vessel wall.

Loss of translucency, in which the arteries lose their power of transmitting light, occurs where a vein is crossed by an artery. The vein becomes obscured at this point and the phenomenon is usually accompanied by an appearance of compression and loss of the light streak in the vein on either side of the point of crossing. In the more advanced stages the vein is practically obliterated from the pressure exerted by the artery, and enlargement of the distal end of the venous current is quite apparent. On the other hand, when the vein crosses the artery it appears to hook over that vessel with less signs of compression of its coats.

Oedema of the retina from interference with its nutrition occurs sooner or later and is recognized as a grayish haze, which is better seen in the macular region or along the course of the vessels. Hæmorrhages into the retina eventually show themselves as the disease advances. These changes occur along the course of the vessels or at isolated spots in the retina, or they may even be sub-hyaloid in character.

Microscopically these changes are found to be due to a thickening and loss of elasticity of the walls of the vessels and to a narrowing of their lumen from the formation of connective tissue, mainly in the intima. These degenerative



alterations effect both the muscular and elastic tissues and eventually bring about hyaline degeneration of the entire vessel wall. The pathologic changes are never really primary in character, but are a part of a general arterio-capillary fibrosis, which has been gradually developing for a variable length of time as the result of the absorption of an endogenous poison produced by some derangement of nutrition.

The eliminating powers of the excretory organs become interfered with and the toxic elements are absorbed into the blood, producing an irritation of an infective nature. The relation of vascular disease to various morbid conditions in certain organs of the body is well known. The causes that lead up to these changes in the circulation depend upon the absorption into the blood of the toxins given off under diseased conditions existing in the general system, which, if not checked, have an effect upon the vascular coats, that ultimately result in pathological changes which sooner or later become permanent and produce degenerations in various organs of the body. They are due to the retention in the system of effete substances which act as poisons, their existence depending upon defective action of the excretory organs.

If such excretory organs as the kidneys and liver, act indifferently there is an accumulation of toxic matter which absorbed into the blood stream produces morbid changes, not only in the vessels of these organs, but more particularly in the general vascular system.

Primary arterio-sclerosis depends in great measure on just such a cause. Arterio-sclerosis in the true sense of the term is probably never of primary origin, but is secondary to a degeneration which has already existed for some length of time. The patients whose retinal vessels show these degenerative changes are generally those who have reached the age of forty or fifty years, who have led a sedentary life, and who are fond of good living. There is, also, a history in most instances of some form of "indigestion," and in many cases there is a distinct history of gout or "rheumatism." It is in such cases that the natural functions of the excretory organs are not carried on perfectly. A form of poisoning results from absorption into the blood of the effete matters which are insufficiently eliminated.

Gout, syphilis and alcoholism are associated very frequently with, and play an important role in the causation of these vascular degenerations. They are very likely in the majority of instances the underlying cause of the arterial disease. What effect the poisons have upon the blood and the vessel wall is not clearly understood, but these changes are probably of such a character as to cause a high blood pressure from increased resistance to the blood current in the peripheral vessels. This is followed by hypertrophy of the heart and eventually atheromatous changes in the arteries. As the disease advances in the system and a general arterio-sclerosis develops, the changes in the retinal vessels may be regarded as merely a part of those vascular alterations that are at the same time taking place elsewhere in the body. These pathologic changes may go on for years without giving rise to any untoward symptoms that have an effect upon the patient's ordinary mode of life. It is only when the disease has advanced to the stage in which foci of sclerosis appear in the kidneys, liver and the larger vessels that notice is taken of them or even a suspicion is entertained that the patient's health is effected and that his life is in danger.

There is probably no other disease in which arterio-sclerosis plays a more conspicuous part than atypical chronic gout, a disease characterized among other changes by a high arterial tension and cardiac hypertrophy. The gouty diathesis predisposes to vascular degeneration of a more or less pronounced type, the presence of which is recognized in retinal changes confined more or less (especially in the early stages) to certain alterations in the retinal vessels and circulation, although these changes do not differ materially from those which are present in the course of arterio-sclerosis due to other causes. It is well recognized that degenerations of the retinal vessels, of the retina itself, are probably more indicative of chronic gout than any other morbid process. This is probably due to the presence of deleterious matter in the blood, which, acting on the coats of the vessels induces a high arterial tension, and is responsible for the alterations in the arterial walls themselves. These same causes bring about sclerotic metamorphoses in the smaller bloodvessels and capillaries.



The degenerative changes show themselves in the retina by alterations in the appearances of the bloodvessels which in the early stages are so slight that they are easily overlooked if a careful examination is not made. The retinal arteries are diminished in caliber with more or less tortuosity of the distal end of the vessel; the bright streak is broader and there is decided loss of translucency, so that the underlying vein at a point of crossing does not show itself through the artery but seems pressed upon almost to the point of obliteration.

As this degeneration becomes more extensive œdema of the retina, even to the extent of interference with the visual power, develops. Later on, in the more advanced stages of the sclerosis, the vessels become engorged and tortuous, and hæmorrhages take place from the degenerated capillaries.

#### PROGNOSIS.

The significance of these retinal changes and the influence they exert upon the life of the individual depend largely upon their cause and the progression of the degeneration in other portions of the body. The degenerative process which so often has an insidious beginning may have gone on for some time before any abnormalities in the ocular fundus are noticed. Not until gross lesions have shown themselves in the eye can we positively say that a fatal termination is apt to occur. The mere fact that such conditions exist in the retinal vessels, does not warrant us in assuming that the disease is going to progress to such a stage as to effect the function of the kidneys and liver or to cause degenerative changes in the brain.

The course of arterial degenerations is usually a slow one, although exhibiting periods of exacerbation. The patient's ordinary occupation is very little interfered with. There are ordinarily no symptoms of any moment which would point to an altered state of the general health. The patient lives his daily life unconscious of the existence of these phenomena until some marked symptoms from the occurrence of retinal hæmorrhages, thrombosis of the retinal vessels, etc., show themselves and the clinical aspect of the case becomes decidedly changed. When these vascular changes are recognized and appropriate treatment is instituted early, the progress of



the disease may be arrested and the patient's health remain apparently in a normal condition. An unfavorable prognosis depends upon the state of the heart and other organs. When the degeneration has so far advanced that the vascular walls are impregnated with tissues that are foreign to them and hæmorrhages into the retina and obstructions in the circulation have occurred, then an arrest of the progress of the disease cannot be hoped for. The main points I desire to bring out in this paper are embodied in the following conclusions:

1. The retinal vessels are liable to changes which are indicative of general vascular disease.

2. That these changes are readily recognized by ophthalmoscopic examination in the very early stages of the arterial degeneration.

3. When recognized early and appropriate treatment is applied, the disease can be arrested and a favorable prognosis given.

4. The principal early ophthalmoscopic signs are, (a) contraction of the arteries; (b) compression of veins where crossed by arteries; (c) loss of translucency of the arteries; (d) broadening of the reflex streak along the course of the vessels.

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#### EDITORIAL NOTICE.

We are asked to state that an investigation as to the HEREDITY OF ALBINISM IN MAN is being carried out by Professor Karl Pearson, F.R.S., of University College, London (Eng.), with the co-operation of Mr. E. Nettleship (Shottermill, Surrey, Eng.), and Dr. E. Stainer (Physician to the Skin Department, St. Thomas' Hospital), 60 Wimpole St., W., London (Eng.), and that cases bearing on the subject, *either positively or negatively*, will be very thankfully received by any of those gentlemen. The investigators desire to collect a large series of examples of Albinism—complete or incomplete, general or partial—in which the family history of the albino patient can be traced for one, two, three or more generations. The sex and prevalent color of eyes and hair in as many of the patients' relations and ancestors as possible should also be noted, whether any of them were albinotic or not; also all instances of consanguineous marriage. Cases of albinism of the eyes in persons with congenitally pied skin (most easily recognized amongst dark races) will also be very valuable even without family history—acquired leukoderma being of course excluded.

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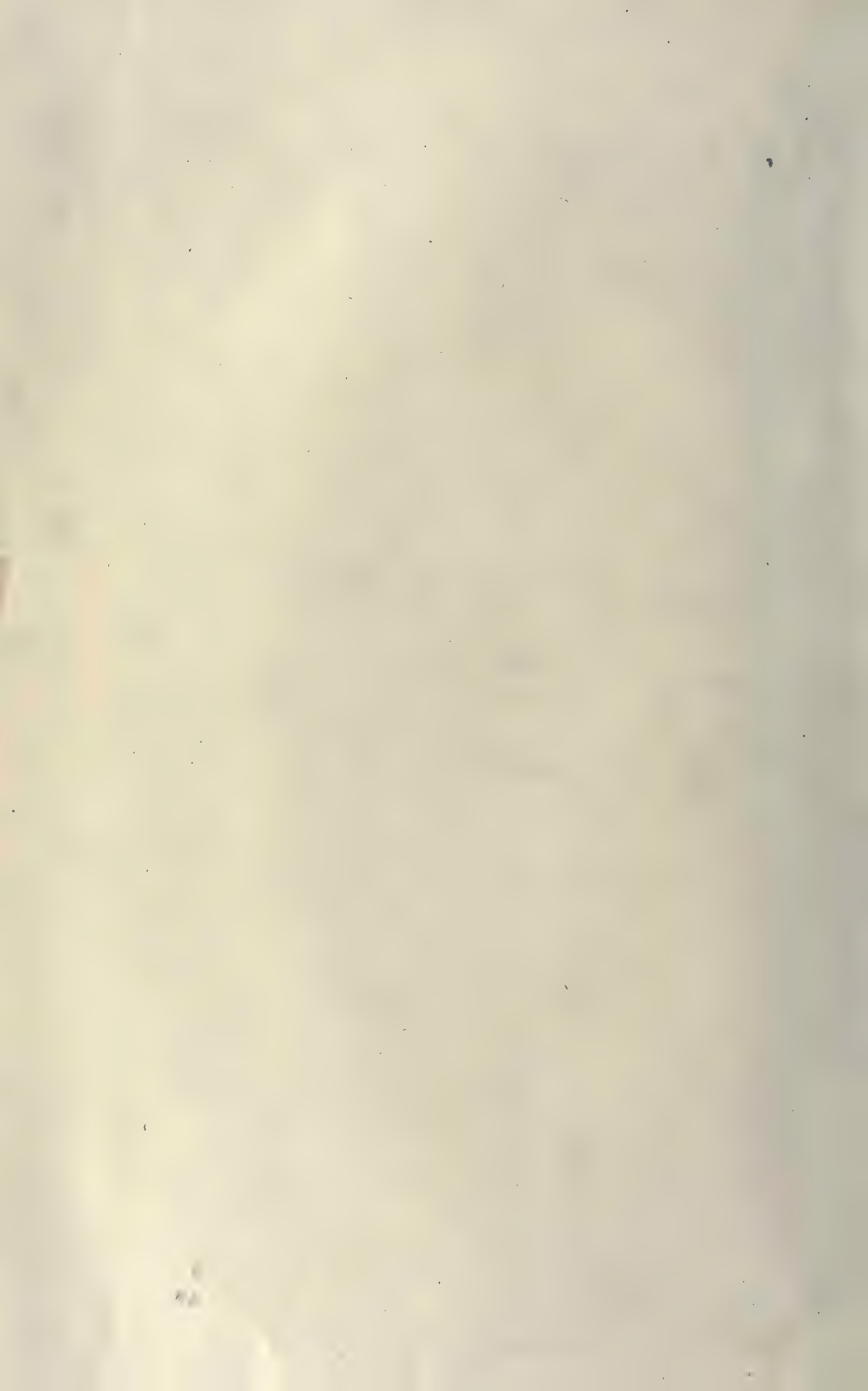
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